Advant® OCS
with Master software

Functional Units Part 2
AI AO DI DO

User's Guide

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Chapter 1 Introduction

1.1 General

The function library available in an ABB Advant Controller 400 Series installation includes an extensive range of different data base elements and PC elements. A required control function can be built up with the AMPL language (ABB Master Programming Language).

Functional units are available to supplement the library for more complex functions. The functional unit is a “package” of different program functions (such as PC elements and data base elements).

Each functional unit has a specific communication module for connection to the Operator station (for control and supervision). The operators handling in the Operator Station has a function adapted dialog. Standardized display elements are used for visual indications.

The packaging simplifies documentation and implementation of, for example, functions with both control function and associated operators actions via display screen and keyboard. PC elements and functional units can be used freely together.

Applications include feedback control, sequence control and motor/valve controls.

The functional units are constituted of pre-prepared parts. These consist of different control functions or interfaces to a user designed control function and different operators, alarm and event handling functions.

The descriptions of the functional units for process signal connections, AI, AO, DI, DO include a certain hardware function to give a complete picture of the function. All other functional units are completely implemented in software.

NOTE

General knowledge of the Advant Controller 410/450 and Advant Station 500 Series Operator Station systems is required to fully understand the contents of this manual.

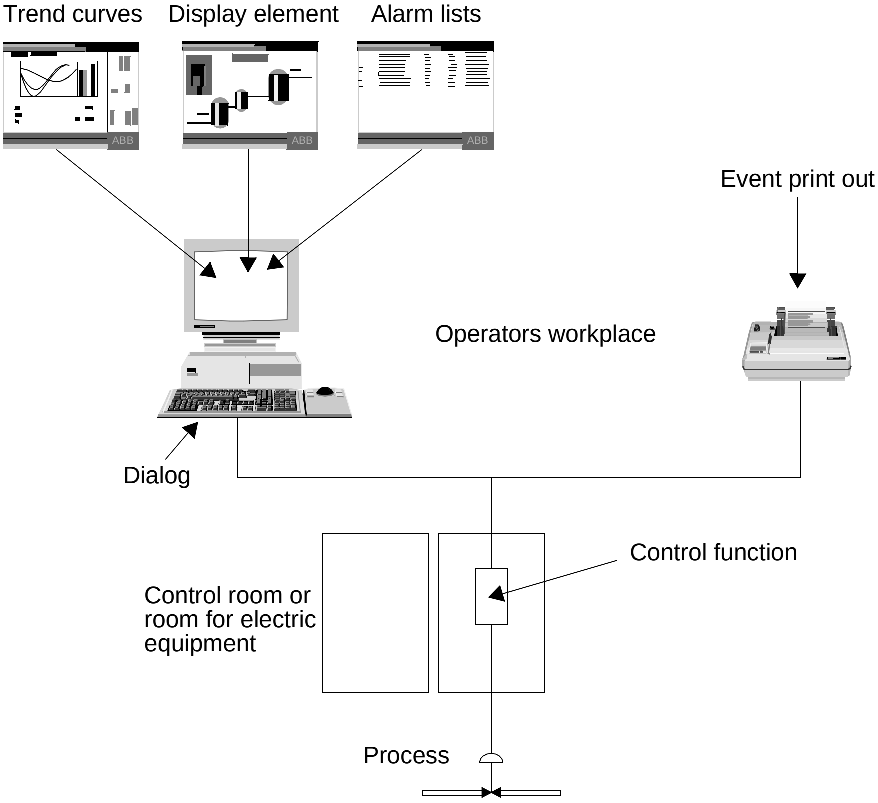


Figure 1-1. Software functions which can be included in a functional unit

1.2 Structure of the Manual

The manual, Functional Units, is for practical reasons divided into seven (7) physical parts. The contents of these seven parts are:

Part 1	Common Properties
Part 2	AI AO DI DO
Part 3	SEQ GROUP
Part 4	PIDCON RATIOSTN MANSTN
Part 5	GENCON GENBIN GENUSD
Part 6	MOTCON VALVECON
Part 7	PIDCONA

Functional Units Part 1 Common Properties, may be read first, in order to define the Functional Unit philosophy. This part also includes descriptions of common properties, valid for all Functional Units.

Part 2 to 7 do not have to be read in part number order. Each part stand by itself (together with part 1). A reader can start with Part 1 and then succeed with the part most urgent.

The contents of the different parts are:

Functional Units Part 1

- General descriptions of the functional units
- Descriptions of common system functions

Functional Units Part 2

- AI (Analog Input). The functional unit AI (Analog Input) incorporates functions for:
  - Scanning of analog and pulse train inputs from the process
  - Filtering, linearization and scaling of such inputs
  - Storage of such inputs or internally calculated analog variables
  - Update blocking and input simulation
  - Limit checking
  - Operator station functions
  - Internal and external alarm detection and handling.
- AO (Analog Output). The functional unit AO (Analog Output) incorporates functions for:
  - Output signal storage and updating
  - Auto and manual modes of control
  - Limit checking prior to storage
  - Scaling and output of an analog control signal to the process
  - Operator station functions.
- DI (Digital Input). The functional unit DI (Digital Input) incorporates functions for:
  - Scanning of digital process inputs.
  - Filtering and inversion of such inputs.
  - Storage of input data
  - Update blocking and input simulation
  - Operator station functions.

- DO (Digital Output). The functional unit DO (Digital Output) incorporates functions for:
  - Output signal storage and updating
  - Auto and Manual modes of control
  - Inversion of stored data prior to output
  - Output of a digital control signal to the process
  - Operator station functions.

Functional Units Part 3

- SEQ (Sequence).
  - SEQ (Sequence) is a software package - a functional unit - designed for universal use in sequence applications.
- GROUP (Group).
  - GROUP (Group) is used for group-start and group-stop of motors, valves and other binary objects coordinated as a group in the process. These objects are normally controlled by MOTCON or VALVECON with which GROUP is compatible.

Functional Units Part 4

- PIDCON
  - PIDCON has been developed for control functions in different processes. It is therefore called a process controller.
- RATIOSTN
  - RATIOSTN is mainly intended for ratio control. This ratio control is performed in cooperation with a process controller PIDCON or PIDCONA.
- MANSTN
  - MANSTN is intended for control of unregulated objects.

Functional Units Part 5

- GENCON
  - GENCON (GENeral object CONtroller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.
- GENBIN
  - GENBIN (GENeral object BINary controller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.
- GENUSD
  - GENUSD (GENeral object USer Defined controller) is a general tool which enables the user to create desired control functions. This Functional Unit include a User Defined PC Program.

Functional Units Part 6

- MOTCON
  - MOTCON is a functional unit designed for the control of motors in different processes.
- VALVECON
  - VALVECON is a functional unit designed for the control of 2-position valves in different processes.

Functional Units Part 7

- PIDCONA
  - PIDCONA is a complete PID control function with autotuning and adaptive control, including functions for operator interface and event handling.

1.3 Purpose of the Manual

The purpose of this manual is to give the Advant Controller 400 Series implementer information about the powerful library of predefined function units "packages", in order to provide all the information needed for the use of the different functional units.

Functional Units Part 1, contains the following information:

- General descriptions of the functional units
- Descriptions of common system functions

The other six parts include

- Detailed descriptions of the design and function of the different functional units
- Examples of applications

1.4 Other documentation

In addition to the unified documentation for the functional units offered by these series of Function Units Parts (part 1-7), there are other manuals which document individual types of program functions within a functional unit. There is, for example, a reference manual, *PC Elements Advant Controller 400 Series Reference Manual*, which embraces all of the PC elements included in the controller. The PC elements contained in any particular functional unit are also included in this. A corresponding manual is available for data base elements, *Data Base Elements Advant Controller 400 Series Reference Manual*. Both are valuable aids for practical use in the day-to-day design work, when knowledge of the function is available. Information in this manual is based on the following documents:

- *PC Elements Advant Controller 400 Series Reference Manual*
- *Data Base Elements Advant Controller 400 Series Reference Manual*
- *AdvaCommand Basic Functions User's Guide*
- *AdvaCommand User Interface Reference Manual*

Chapter 2 Analog Inputs

The functional unit Analog Input is a part of the Advant OCS system. The unit incorporates functions for:

- Scanning of analog and pulse train inputs from the process
- Filtering, linearization and scaling of such inputs
- Storage of such inputs or internally calculated analog variables
- Update blocking and input simulation
- Limit checking
- Operator station functions
- Internal and external alarm detection and handling.

There are versions of Analog Inputs for:

- Current inputs with or without live signal zero
- Voltage inputs with or without live signal zero
- Redundant boards
- Pt100 temperature transducers
- Thermocouple inputs
- Pulse train inputs
- External events
- Remote I/O units
- Internally calculated variables.

All these utilities make the unit a powerful tool for implementing process supervision and control. The existence of pre-configured functions, beyond the basic ones for input scanning and storing, means that the application engineering time, and cost, can be significantly reduced.

2.1 Configuration

2.1.1 General

The functional unit Analog Input consists of a number of hardware and software parts:

- An input channel of an analog (or a pulse train) input board.

- A data base element for storage of parameters describing the input board used and defining its function. A data base element may be seen as the outward representation of a data record. The existence of data base elements for input board description facilitates easy change of board type and various functional parameters.
- A data base element for storage of the process input signal and various other descriptive properties and control parmeters. The purpose of using a data base element for input storage is to achieve convenient access to all relevant data at one place only.
- Operator station functions consisting of pre-configured presentation, dialog, event and alarm handling.

All these parts relate to each other according to the Figure 2-1.

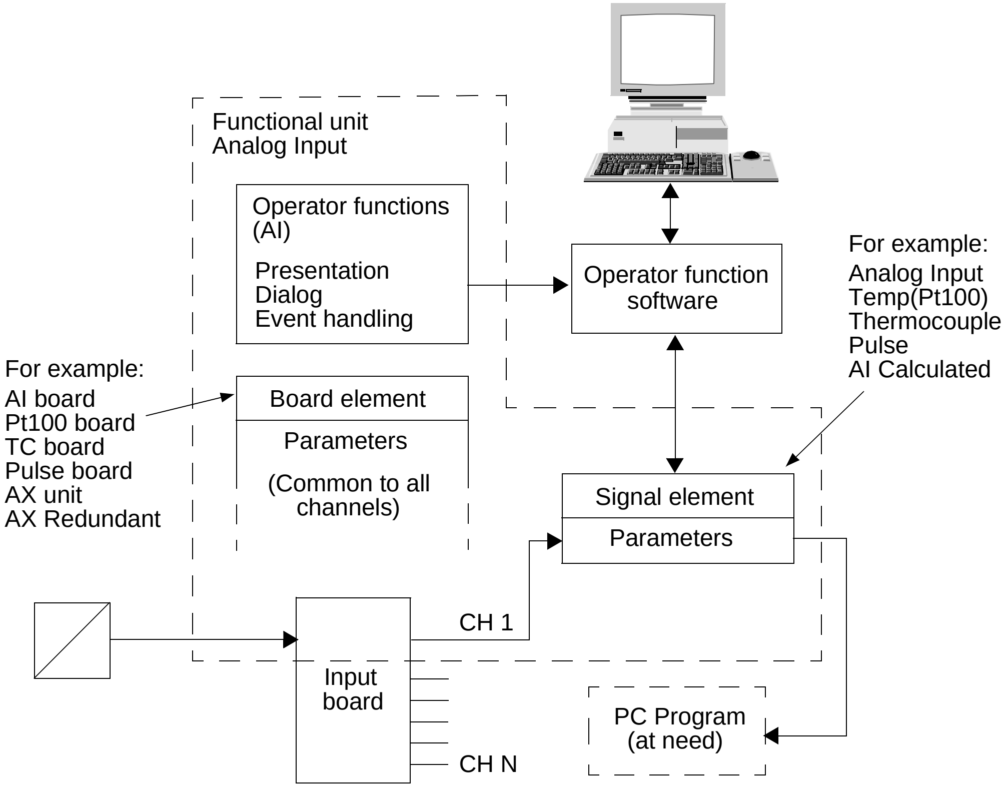


Figure 2-1. The structure of the functional unit Analog Input

Naturally, signals thus stored may then be read from another section of the PC program and used there for further arithmetic of logic processing.

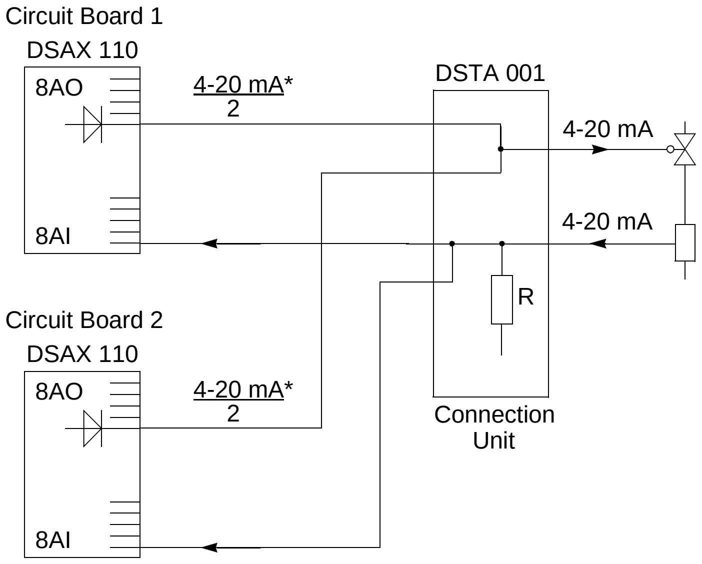
The actual signal value is cyclically updated on displays and lists of the Operator Station connected. Alarms and other "binary" events may however be updated immediately using so called "event driven" updating. For these reasons AI's are suitable for handling real or calculated process inputs where alarm level supervision is considered important.

2.1.2 Redundancy

The operational reliability and availability of critical control loops can be improved by redundant I/O-boards.

Functional units like Analog Input and Analog Output can make use of such specially developed boards. There are boards available including analog inputs only and boards including both inputs and outputs.

Redundancy is easily implemented by the ready made data base function and integrated diagnostics and status presentation. The Figure 2-2 illustrates the hardware implementation of redundancy for a 8 channels analog input-output board type DSAX 110.



* Normally: Load sharing
C.B. error: Faulty board 0 mA
Non faulty board 4-20 mA

Figure 2-2. Implementation of redundant loop I/O

The two circuit boards are functionally brought together in the software by a common board data base element AX Redundant. The continued signal treatment in the software is then carried out in the normal way. Please observe that the combined AI, AO board DSAX_110 make reference to both Analog Input and Analog Output elements. This is illustrated in Figure 2-3.

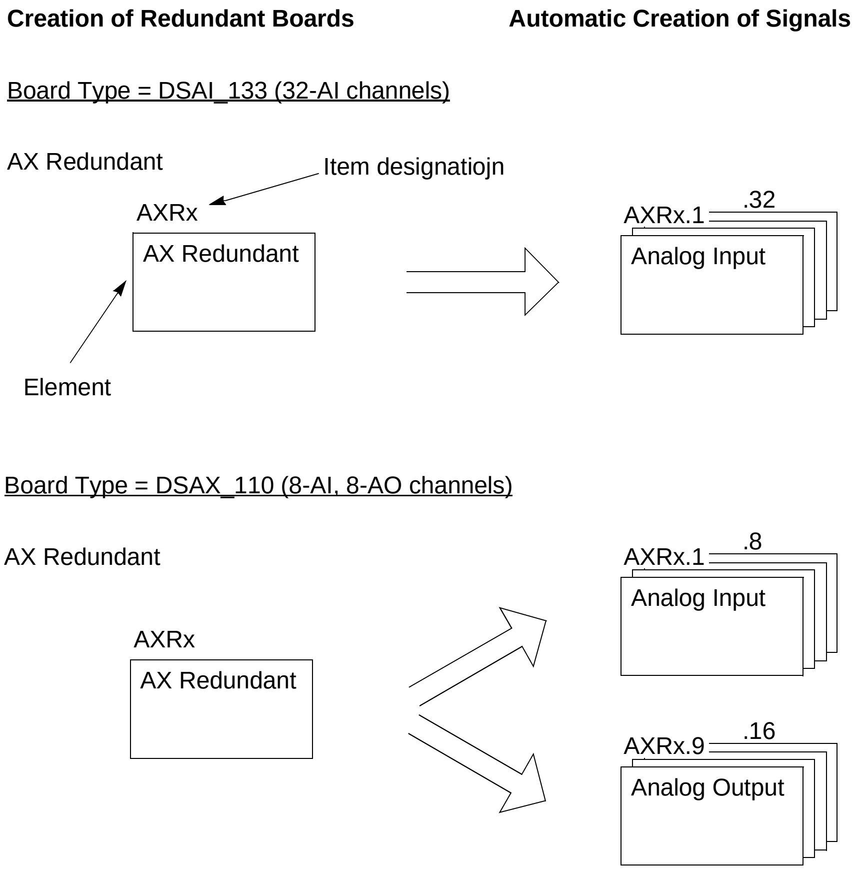

Creation of Redundant Boards
Automatic Creation of Signals
Board Type = DSAI_133 (32-AI channels)
AX Redundant
Item designatiojn
AXRx
AX Redundant
Element
AXRx.1
.32
Analog Input
Board Type = DSAX_110 (8-AI, 8-AO channels)
AX Redundant
AXRx
AX Redundant
AXRx.1
.8
Analog Input
AXRx.9
.16
Analog Output

Figure 2-3. Function implementation in software

The following function descriptions are mainly relevant to both single and duplicated hardware.

Divergencies are dealt with in the Section Function (notes on S400 I/O).

2.2 Standard Current and Voltage Signal, AI

A number of input boards with different technical data such as number of channels, accuracy, linearity are available in the Advant Controller system. Local or remote process connection of standard signals is possible.

There are some board types adapted to redundant applications that can also be used in single applications utilizing the enhanced diagnostic features.

Each board type is covering the common standard signal ranges needed for connection of process measured values from different kind of transmitters, potentiometers etc. Information of the complete range of circuit boards for local process connection is given in the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide*.

The same information comprising remote connection is given in the manual *MasterFieldbus and S400 I/O User's Manual*. This document also includes the hardware function of the remote connected boards.

2.2.1 Function

AI board AI

Function of the AI board

The process signal lines are connected in the connection unit. In this unit the user has to select for voltage or current input signal. At delivery the unit is set up for current input. A resistor should be cut off to select voltage input. The connection unit also performs overvoltage protection and hf-filtering.

The board contains:

- a low-pass filter (6.5 Hz) for each input
- a multiplexer that selects input
- an amplifier with programmable gain that selects one of four input ranges
- an A/D converter.

The multiplexer, amplifier and A/D converter are controlled by the Central unit.

The Central unit cannot check if current or voltage input is selected, it treats all as voltage.

2 reference input channels are included. One should always read 0 and the other full range, otherwise the ERRor terminal is set.

A red LED indicates fault or not initiated board. A yellow LED indicates A/D conversion (board scanned).

Address selection: The address to be set is given in the head of the data base element.

Example: the first analog input board is located at hexadecimal address 20=0010 0000 (i.e. address bit 5 set).

Refer to the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide* for more detailed information regarding the boards.

Connection Units for the AI boards

Board	Connection Unit
DSAI_110	DSTA 121
DSAI_130	DSTA 131, DSTA 133
DSAI_130H	DSTA 131, DSTA 133

Board Set-up Procedure

With the data base element you set up the board for the process communication program.

The board set-up procedure includes:

1. Implementation
2. Disabling
3. Board Type Selection
4. Self Test And Board Change Test
5. Default Signal Range
6. Error Handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process data communication, PDC. If you set IMPL=0, the board, and the signals associated with it, are removed from the PDC's tables at the next scan.

2. Disabling

You can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all Central unit load. This function will be used if a board must be unplugged during operation. If Advant Station 500 Series Operator Station is included in your system - see the Advant Station 500 Series Operator Station manuals.

3. Board Type Selection

Board	Resolution	Connection	No. of input channels	
			Single ended	Diffe-rential
DSAI_110	8 bits	DSTA 121	32	–
DSAI_130	12 bits	DSTA 131 DSTA 133	– 8	16 8
DSAI_133	12 bits	DSTA 002	32	–
DSAI_135	8 bits	DSTA 131 DSTA 133	– 8	16 8

The full name of the board, including ”_” must be entered. TYPE must be selected when creating the element. Please note that DSAI_130H is to be entered as DSAI_130.

Once created, a board type can be changed if the new board type has the same number of channels as the old one. If not, the data base element and the subordinated signal elements must be deleted.

4. Self Test And Board Change Test

The board performs a self-test at 5 sec intervals, using the reference channels (on-board inputs). This test does not perform calibration of the inputs. At the same time, a test that enables board change during operation is performed.

5. Default Signal Range

As a typing aid, you may enter normal signal range for this board as CONV_PAR, when creating the element. This range will be the default range for all subordinated signal elements. CONV_PAR in this element is used only when creating signal elements.

6. Error Handling

The ERR terminal is set in AI board element,if the control function has determined the board non-functional.

Typical errors are non-existent, malfunctioning or improperly strapped hardware or software or data base errors.

The ”ERR” terminal can be connected to the PC program for desired function.

ERR is reset, at hardware errors, automatically within 5 seconds of replacement of the board.

The fault lamp on the board is lit when ERR is set (if the Central unit still has access to the board).

Analog Input AIS, AIXS, AIXRS

Function

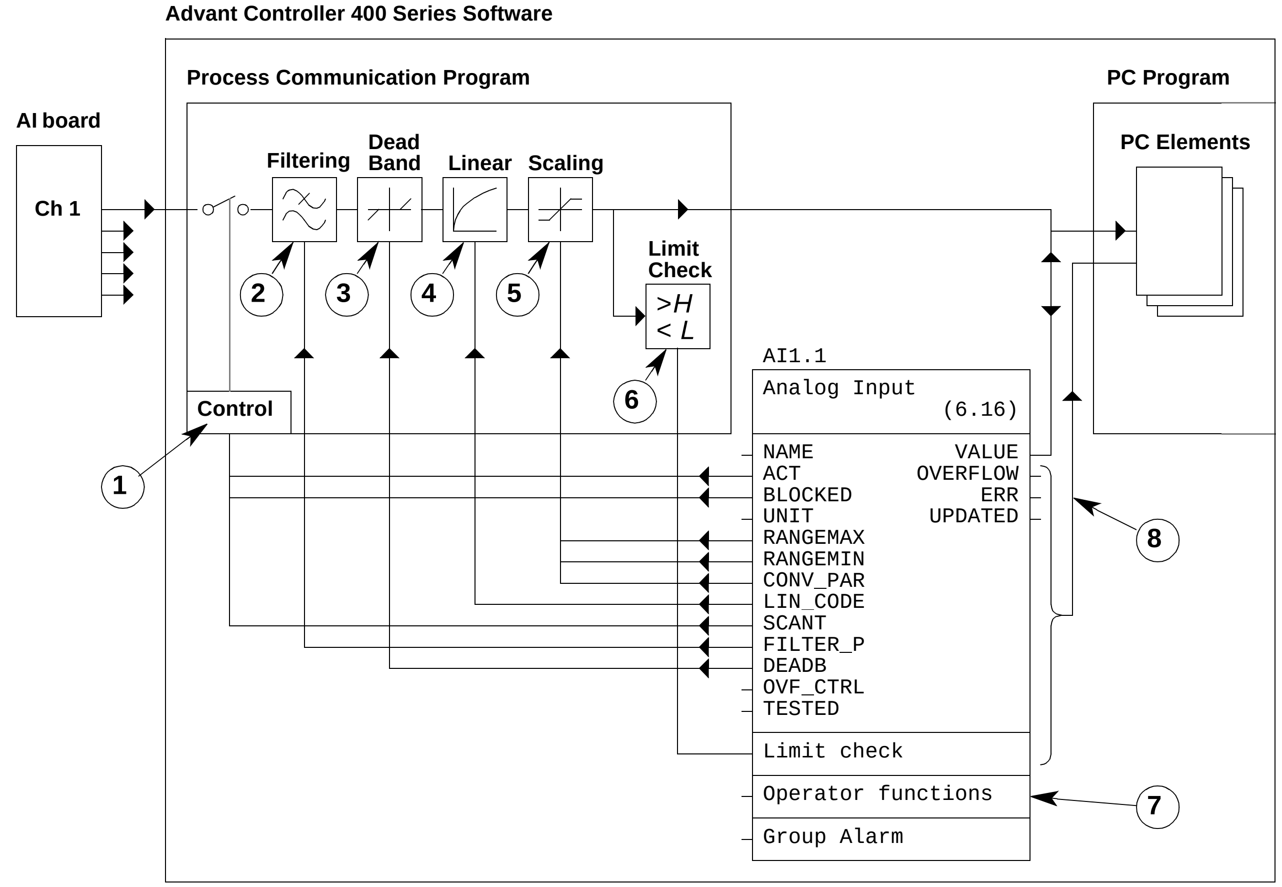
The Analog Input data base element defines a standard analog input signal. With the data base element you control the signal processing executed by the process communication program. You can also define limit checking and the interface to the Advant Station 500 Series Operator Station system.

The signal processing includes:

1. Updating
2. Filtering
3. Variation Control (deadband)
4. Linearization
5. Scaling
6. Limit Check
7. Operator Station functions
8. Error handling

The figure below illustrates this process.

Function of Analog Input Terminals



See ”Notes on S400 I/O” for further information on applications using S400 I/O via ABB MasterFieldbus.

1. Updating

The analog signal is converted and read at intervals determined by the terminal SCANTime. You should set SCANT to the requirements of your system.

If you set BLOCKED, the data acquisition stops, allowing manual entry of ”VALUE”.

To disable the data acquisition completely, you set ACTivated to 0. This excludes the input from processing.

2. Filtering

You may select software filtering of the process value in addition to the hardware board filter (8 Hz, τ =25 ms).

The FILTER_Parameter time constant is a quantity including SCANTime. Example: 2xT at a scan-time of 100 ms gives a time constant of 200 ms. The filter corresponds to a one-pole low-pass filter.

FILTER_P=0 disables the software filter.

3. Variation control

With DEADBand you select the accuracy of the updating. If the input value has not changed more than the DEADBand, since the previous update, no updating or further processing will take place. This function is valuable in reducing signal noice and unnecessary data processing.

DEADBand=0 means updating at each change of input reading (i.e. using the full resolution of the A/D converter, but no unnecessary updates).

DEADBand= –1 forces update at each reading. (Can be used temporarily to get a new value after change of RANGEMAX and so on.)

4. Linearization

For special transducers with quadratic characteristics, e.g. flow measurement, you may select linearization using root extraction. This function is obtained with LIN_CODE=1.

Other types of linearization is obtained by PC programming (e.g. using arithmetic elements or function generator elements).

5. Scaling

All values are used in the system as engineering units. You enter scaling in two steps.

1. Nominal input range

With CONV_PAR you select the measuring range, using the nominal limits for the physical signal expressed in volts or mA.

See the section ”Signal ranges”. The CONV_PAR entered for the AI board will appear as default in the signal, to avoid unnecessary typing. See the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide*, for strapping the hardware for voltage or current.

With RANGE_MAX and RANGE_MIN you determine the meaning of the signal in the engineering unit. The values to be entered are those corresponding to the signal limit values in the CONV_PAR. The engineering unit can be entered in UNIT, for documentation and display purposes.

2. Range example

If the input of 0 volt represent 0 m/s and 10 volts the speed of 50 m/s, set:

CONV_PAR=0..10 V

UNIT= m/s

RANGE_MIN=0

RANGE_MAX=50

VALUE will normally have the range 0-50 (±2%; i.e. –1..51 before out-of-range error occurs).

6. Limit check

In the Limit check part of the data base element you determine whether and how a limit check will be performed. The result is stored in the output terminals and is thus available to PC and other programs. If the NORM_TReat terminal is set to 1 each change in limit check status is also sent to the Advant Station 500 Series Operator Station.

The main use of this function is for Advant Station 500 Series Operator Station presentation, but it is also a convenient alternative to limit checking with PC element COMP-R.

7. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and Functional unit documentation.

8. Error handling

The control function of an AI signal indicates errors via ERR and OVERFLOW. Four types of errors can occur, two that are caused by the system and two that are caused by the operator.

1. ERR in the AI, AX Redundant or AX unit element is set

   This occurs if the local or remote board function is determined non-functional. Typical causes of this type of error are: missing or faulty hardware, incorrectly installed hardware or errors in data base or software. For AX (ABB MasterFieldbus) the error could be in the bus communication.

   ERR in the AI board, AX Redundant or AX unit are copied to the error handling function of all channels and the error flag ERR is set to 1 for all channels. VALUE is not updated if this type of error occurs and the old value of this terminal is retained.

   The LED on the board front usually shows a steady light if the board is faulty.

   ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional hardware unit.

2. Out of range values

   ”Overflow” or ”underflow” will occur if the A/D converter is given values out of its range. Different ways of handling this can be obtained through the use of the OVF_CTRL parameter. The parameter does not affect the handling of the electrical signal's passage through zero.

   See the table for Indication at Out-of-Range AI-signal for details of the relationships between the level of the electrical input signal, status indications and indication/limits of VALUE.

   Detection of out-of-range signals can give indirect information about various errors, e.g. disconnected transducers, cut electrical connections, loss of power supply or other hardware and system errors on signal level.

   ERR and OVERFLOW are reset when the error is corrected.

3. ERR is set when the SERVICE terminal in the AI board or AX Redundant element has been set to 0 by the operator

   The LED does not show any light. ERR is reset when SERVICE has been set to 1 again.

4. The board was not implemented at the latest system initiation

   The LED on the board front shows steady light if this type of error occurs.

   ERR is reset by entering IMPL in AI board or AX Redundant.

   The ERR and OVERFLOW terminals of the Analog Input element and the ERR terminal of the AI board and AX unit elements can be connected to PC programs where the desired function may be built.

Function (notes on S400 I/O)

The data acquisition is handled by the remote AX unit that is connected to Advant Controller 400 Series via ABB MasterFieldbus.

An AX unit's software configuration is determined through a comparable to an AI board element for an Analog Input unit located in the Advant Controller 400 Series framework.

All handling of the individual signal, and it's Analog Input element, is the same regardless of whether local or remote data acquisition is used. See below for a few minor differences and some advice on the use of S400 I/O.

1. Updating

The DSAX_452 variant of the AX unit is available in this edition of the system. This unit uses a slow integrating A/D-converter with a conversion time of ca. 50 ms/activated channel. The signals in a unit are converted in sequence and the number of activated channels (ACT=1) thus determine how often each conversion is repeated (cyclicity).

This means that one should only activate the channels that are actually used to ensure the best possible cyclicity.

The mirroring of converted measurement data via MasterFieldbus to the control unit of the Advant Controller 400 Series does not require any significant time delay.

2. Linearization

Linearization for transducer with quadratic characteristics may not be selected.

3. Error handling

The ERRTYPE terminal of the AX unit element gives additional information on the fault.

Indication at out-of-range AI signal

Electrical signal	Parameter	Status indications				Value indication/limit	Notes
(% of max. input)	OVF_CTRL	WARNING (AI_BOARD)	ERR	OVERFLOW (Analog input)	ERR	VALUE (% of RANGE_MAX - RANGE_MIN)	–
Unipolar (+)							Deviation S400 I/O
> 102.4%	0 1	1 0	0 0	1 1	1 0	(1) 2.4% over RANGE_MAX	RANGE_MAX RANGE_MAX
< 10% (“floating zero”)	0 1	0 0	0 0	0 0	1 1	12.5% below RANGE_MIN (2) 12.5% below RANGE_MIN (2)	RANGE_MIN RANGE_MIN
< 0%	0 1	0 0	0 0	0 0	0 0	RANGE_MIN RANGE_MIN	(3) (3)
< -8%	0 1	0 0	0 0	0 0	1 1	8% below RANGE_MIN (2) 8% below RANGE_MIN (2)	RANGE_MIN (4) RANGE_MIN (4)
Bipolar (±) DSAI 110, 130							
> 102.4	0 1	1 0	0 0	1 1	1 0	(1) 2.4% over RANGE_MAX (2)	RANGE_MAX RANGE_MAX
< -102.4	0 1	1 0	0 0	1 1	1 0	(1) 2.4% below RANGE_MIN (2)	RANGE_MIN RANGE_MIN

(1) Frozen at the value of the preceding sample, provided that OVERFLOW = 1 or set to the value of ERR_VAL if ERR_CTRL=1.
(2) Note: % of RANGE MAX - RANGE MIN
(3) Applies to DSAI 135 and DSAI 133. These boards cannot handle negative inputs.
(4) Applies to DSAI 110, DSAI 130 and DSAX 452 if the transducer can send negative signals.

AX Redundant AXR

Function

Miscellaneous

The AX Redundant (board) data base element covers a pair of equal boards. A board in such a pair has either analog input channels or both analog input and output channels. The pair of boards are connected to one common connection unit. The process signal lines shall be connected to this common connection unit.

Board 1 is selected to be on duty during start up of a redundant board pair, causing ACT_BRD=1. A function check is executing in parallel for both boards.

This board x on duty term means:

- Input signal:

  The value of board x is used.

- Output signal:

  50% comes from board x and 50% from the other board, if the other board is free from error,
  otherwise 100% comes from board x.

If the self test for board 1 detects an error, this board is assigned error indication and board 2 is selected to be on duty. This transition takes place during the same scan period as the error is detected.

When board 1 has been exchanged, the new correct unit is started up and becomes backup. If the new correct board 1 is preferred to be the one on duty, board 2 can be pulled out, a manual Operator Station change-over can be made or the value of ACT_BRD can be changed.

The AX redundant data base element has subordinated channel elements. A subordinated analog input channel element has the call name AIXRS and the item designation AXRx.y where x=board number and y=signal number. A subordinated analog output channel element has the call name AOXRS and the item designation AXRx.z where z=signal number. Otherwise these subordinated elements correspond to ordinary analog input element AIS and to ordinary analog output element AOS respectively.

Use the entry "Number of REDUNDANT/OBJECT_BOARDS" in DIMDB to dimension for the AXR element type.

You can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all Central unit load. This function will be used if a board must be unplugged during operation. If Advant Station 500 Series Operator Station is included in your system - see the Advant Station 500 Series Operator Station manuals.

Signal Ranges

Conversion Parameters, DSAX 110 Input channels

Voltage	0.. 10 V	0.. 5 V	2.. 10 V	1.. 5 V
Current	0.. 20 mA	4.. 20 mA	–	–

See the AI board section for corresponding DSAI_133 board data.

Secure correspondence between the CONV_PAR value and current/voltage strapping at the assigned connection unit.

ADDRx - address of board no x

Check manually if a default address value will cause any conflict with other boards, because none automatic check of this is performed. Default values are calculated as far as there is space enough within the address range (192-239) for OTHER boards, otherwise a zero value is presented. The ADDR1 is calculated using the formula:

190 + rec_no×2 (where rec_no is the record number in the data base for this element).

The ADDR2 is calculated using the formula:

191+rec_no×2

In case of a zero default address value - use an unoccupied address in the space among AI, AO, DI and DO boards, eg address 32..191.

Enter the address as a decimal number, which is then converted to binary format and displayed in the element head.

It is possible to only have one board installed, then the ADDR2 terminal shall be set to 0. It is not allowed to set a zero value on ADDR1 and an address in ADDR2.

2.2.2 Data Base Elements

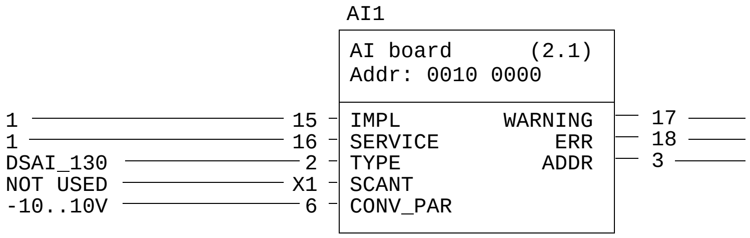
2.2.2.1 AI board

AI board AI

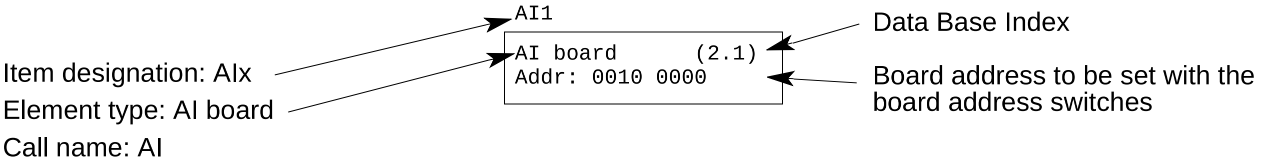
Summary

The AI board data base element holds the data values of the terminals associated to a standard analog input board. The element is superior to the signal elements associated to the analog input channels in the board.

Overview



Head



Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
15	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
16	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–

Terminal Description (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	TYPE	user	DSAI_ 130	–	Board **TYPE**: DSAI_110, DSAI_130, DSAI_133 and DSAI_135.	TYPE must be selected when creating the element. The full name including ”_” must be entered.
X1	SCANT	–	NOT USED	–	**SCANT**ime. Not used.	–
6	CONV_PAR	user	–10..10V	–	The normal signal range can be entered as **CONV**ersion **PAR**ameter, when creating the element. It will only be used as a default value for subordinated Analog Input elements.	Refer to the table for available Signal Ranges in Volts or mA for the different boards. The connection unit must be strapped for voltage or current.
17	WARNING	system	0	B(r)	**WARNING** terminal indicating less serious (non-fatal) error.	–
18	ERR	system	0	B(r)	**ERR**or terminal indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

Signal Ranges

Conversion Parameter

DSAI 110, 130

Voltage	–10.. +10 V	–5.. +5 V	–2.5.. +2.5 V	–1.25.. +1.25 V	±0.. +10 V	±0.. +5 V	±0.. +2.5 V	±0.. +1.25 V	+2.. +10 V	+1.. +5 V	+0.5.. +2.5 V	+0.25.. +1.25 V
Current	–20.. +10 mA	–10.. +10mA	–5.. +5 mA	±0.. +20 mA	±0.. +10 mA	±0.. +5 mA	+4.. +20 mA	+2.. +10 mA	+1.. +5 mA	–	–	–

DSAI 133, 135

Voltage	±0.. +10 V	±0.. +5 V	+2.. +10 V	+1.. +5 V
Current	±0.. +20 mA	+4.. +20 mA	–	–

2.2.2.2 AX unit

Implementation in Advant Controller 400 Series of analog signals physically connected to a remote I/O unit is carried out with a data base element AX unit.

For the time being a single board type combining 14 analog inputs and 6 analog outputs is available. The element AX unit supports both analog inputs and outputs.

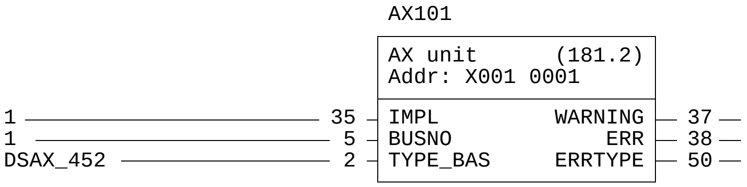
AX unit AX

Summary

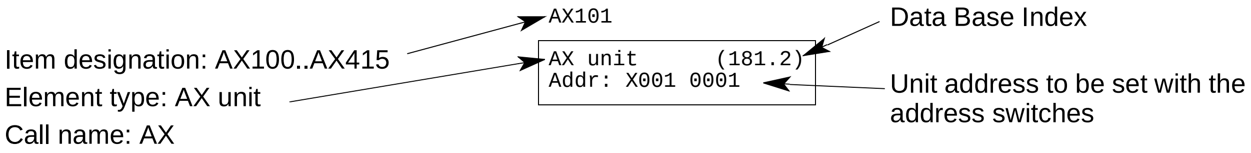
The AX unit data base element holds the data needed to define an analog S400 I/O unit connected to MasterFieldbus.

The element is superior to the Analog Input and Analog Output data base elements for the signals of the unit.

Overview



Head



Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
35	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
5	BUSNO	user	*	I(r/w)	The **N**umber of the **BUS** to which the unit is connected.	See ”BUSNO”.

Terminal Description (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	TYPE_BAS	user	DSAX_452	–	Board **TYPE** of **BAS**ic unit: DSAX_452.	–
37	WARNING	system	–	B(r)	**WARNING**. Fault, not causing stopped execution.	–
38	ERR	system	–	B(r)	**ERR**or flag indicating error, stopping execution.	–
50	ERRTYPE	system	–	I(r/w)	**ERR**or **TYPE**.	See the table for Error Types.

Error Types

Flag E or W indicates whether the element outputs ERR or WARNING are set.

Flag	ERRTYPE	Error
	Not initiated	Illegal BUSNO, IMPL=0 at system init or system not started.
E	Bus controller error	Bus controller board (CI570) is faulty or missing.
E	Communication error	Communication faulty, no reply from unit.
E	TYPE_BAS mismatch	The unit type does not agree with TYPE_BAS.
W	Hardware error	Reference channel error
E	Other error	May be set temporarily during restart.
W	Transducer power	Transducer power of base unit fails (fuse?).
	Error Channel A	Error on redundant channel A (modem, cable?)
	Error Channel B	Error on redundant channel B (modem, cable?)
	OK	No error.

The most significant error (uppermost text in table) is given if multiple error occurs.

BUSNO – Bus Number

With this terminal you select the number of the bus that the AX unit is to be connected to.

The lowest bus number with less than 16 units is given as the default BUSNO value.

BUSNO can be changed if the system is in configuration mode.

BUSNO is included as the first digit in the Item designation. The full unit address to be set on the S400 I/O unit is shown in the element head.

Item designation: AXabb a=bus

Address in binary: xaaa bbbb b=node on bus
x=hi speed/low speed

Example:

Item designation:	AX307
BUSNO:	3
Node on bus:	7
Unit address:	x011 0111

Function

More information is to be found in the manual *S400 I/O User's Guide*.

2.2.2.3 AX Redundant

Implementation in Advant Controller 400 Series of redundant analog circuit boards is carried out with a data base element AX Redundant.

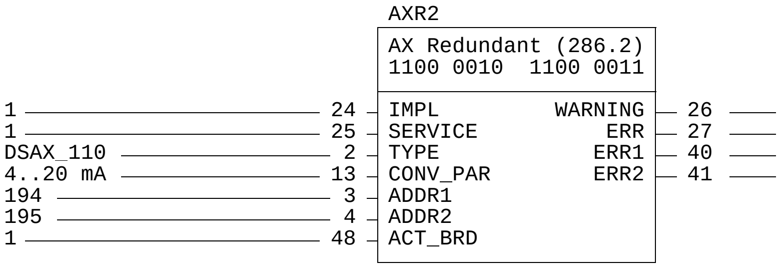
The element supports available boards including analog inputs only and boards including both inputs and outputs.

AX Redundant AXR

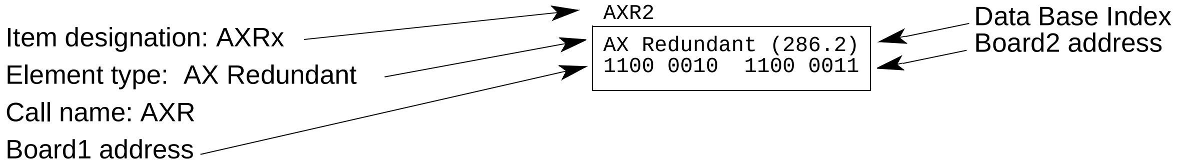
Summary

The AX Redundant data base element covers a pair of equal boards. A board in such a pair has either analog input channels or both analog input and output channels. The AX Redundant data base element has a terminal stating which board is on duty. Further it has terminals specifying board failure. If the board on duty fails the other backup one takes over. The AX Redundant data base element has subordinated channel elements with Item designation AXRx.y - of the type analog input and analog output dependent upon board type.

Overview



Head



Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
24	IMPL	user	1	–	0=the board pair is spare 1=the board pair is **IMPL**emented	–
25	SERVICE	dialog	1	–	The in-**SERVICE** terminal - shows whether the board pair is in service or has been taken out of service.	–
2	TYPE	user	DSAX_ 110	–	Possibilities: DSAX_110 (8 AI+8 AO) and DSAI_133 (32 AI).	–
13	CONV_PAR	user	4..20mA	–	**CONV**ersion **PAR**ameter. Normal input signal range used as default value for subordinated input channel elements.	See the table for Signal ranges.
3	ADDR1	user	*	–	**ADDR**ess of board no **1**.	See ADDRx.
4	ADDR2	user	*	–	**ADDR**ess of board no **2**.	See ADDRx.
48	ACT_BRD	dialog	1	B	**ACT**ive **B**oa**RD**. 1=board 1 is active 2=board 2 is active	–
26	WARNING	system	–	B	**WARNING** flag indicating non-fatal errors.	–
27	ERR	system	–	B	**ERR**or is set only when both boards fails.	–
41	ERR1	system	–	B	**ERR**or flag for board **1**. Set to 1 when board 1 fails.	–
42	ERR2	system	–	B	**ERR**or flag for board **2**. Set to 1 when board 2 fails.	–

2.2.2.4 AI channel

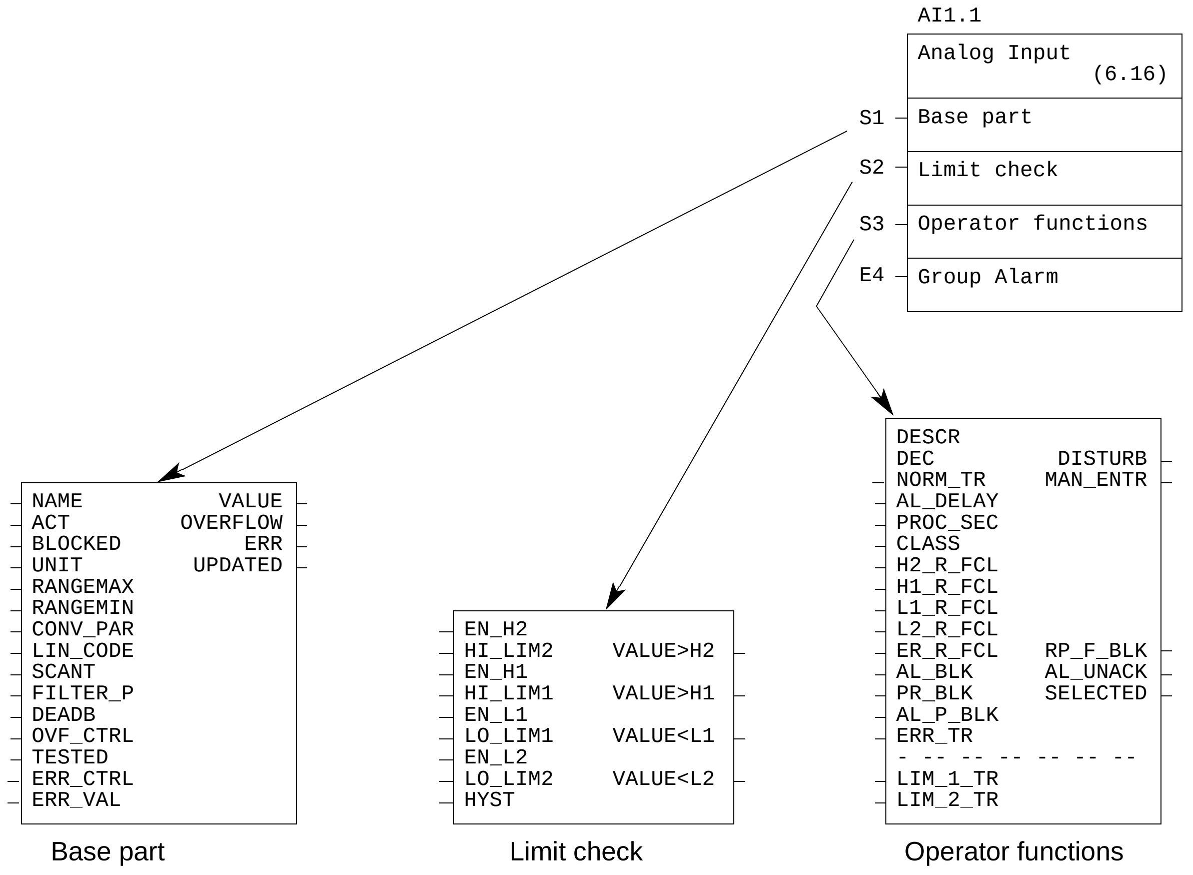
Analog Input AIS, AIXS, AIXRS

Summary

The data base element Analog Input is subordinate to the AI board data base element, the AX unit data base element or the AX Redundant data base element.

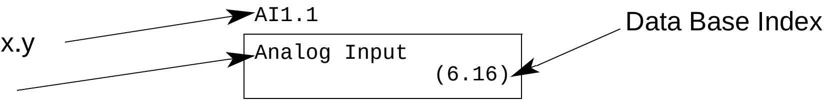
For information about the extension parts of Group Alarm see data base element Group Member.

Overview

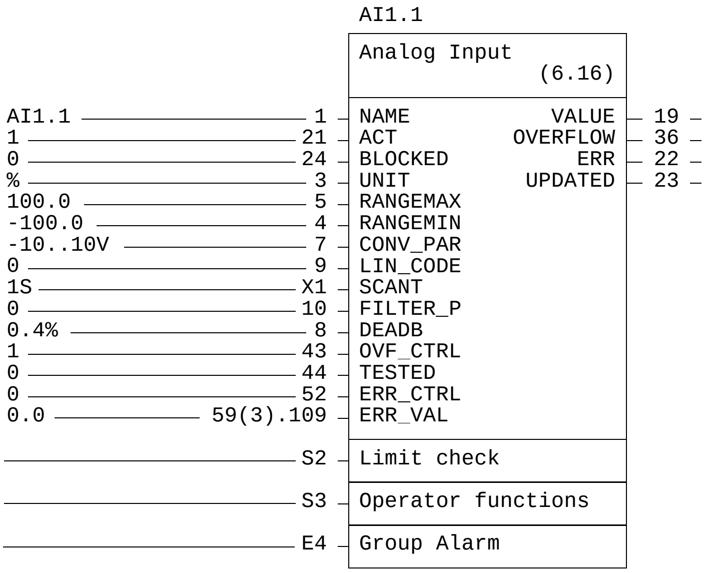


Head

Item designation: AIx.y or AXx.y
Element type: Analog Input
Call name: (AIS) with S100 I/O,
(AIXS) with S400 I/O,
(AIXRS) with AX Redundant I/O



Base part



Terminal Description, Base part

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
1	NAME	user	AIx.y, AXx.y *or* AXRx.y	–	Each Analog Input signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive (scanned by the data acquisition program).	–

Terminal Description, Base part (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal VALUE is **BLOCKED**.	–
3	UNIT	user	%	–	The signal **UNIT** in engineering unit. Empty string is entered as a dot (.).	Max. 6 characters shown in Operator Station and data base element.
5	RANGEMAX	user	100.0	R(r/w)	**RANGE MAX**imum input in engineering units (e.g. 100 kg) for maximum input signal (e.g. 10 Volt).	Derives scaling.
4	RANGEMIN	user	–100.0	R(r/w)	**RANGE MIN**imum input in engineering units (e.g. 0 kg) for minimum input signal (e.g. –10 Volt).	Derives scaling. Default for AIXRS: 0.0.
7	CONV_PAR	user	from AI board or –10..10V	–	The normal signal range entered as **CONV**ersion **PAR**ameter. Refer to section Signal Ranges for available signal ranges in Volts or mA.	The connection units must be strapped for voltage or current.
9	LIN_CODE	user	0	–	**LIN**earization **CODE**=1 gives a linearization of signal with square characteristic.	Not available for AX with S400 I/O.
X1	SCANT	user	1s	–	**SCAN T**ime interval for input: See Introduction, ”Allowed SCANT values”.	Modification is carried out at the next scan.
10	FILTER_P	user	0	–	Input **FILTER**ing in software. Filter **P**arameter depends on SCANT(T), 0,2*T, 4*T, 8*T, 16*T, 255*T.	The AI board performs hardware filtering.
8	DEADB	user	0.4%	–	Signal **DEADB**and limit percentage. If the signal variation exceeds the limit, the value will be updated.	Refer to section DEADB values for available ranges. The DEADB is set in percentage of 2 x the nominal positive max value of the used measuring range.
43	OVF_CTRL	user	1	B(r/w)	1=alternative **OV**er**F**low **C**on**TR**o**L** handling.	See Function ”8. Error handling”.
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
52	ERR_CTRL	user	0	B(r/w)	**ERR**or **C**on**TR**o**L**. 0=Value is frozen when error occurs. 1=Value is set to the value of ERR_VAL when error occurs.	–
59(3).109	ERR_VAL	user	0.0	R(r/w)	**ERR**or **VAL**ue. Value to be set when error occurs and ERR_CTRL=1.	–

Terminal Description, Base part (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
19	VALUE	system	–	R(r/w)	Process **VALUE** in engineering unit.	–
22	ERR	system	–	B(r/w)	1=Hardware or configuration **ERR**or or signal overflow.	–
36	OVERFLOW	system	–	B(r/w)	1=dynamic indication of **OVERFLOW**.	See Function ”8. Error handling”.
23	UPDATED	system	–	B(r/w)	1=system indicates that VALUE has been **UPDATED**.	–

Signal Ranges

Conversion Parameters, S100 I/O

Voltage	–10.. 10 V	–5.. 5 V	–2.5.. 2.5 V	–1.25.. 1.25 V	0.. 10 V	0.. 5 V	0.. 2.5 V	0.. 1.25 V	2.. 10 V	1.. 5 V	0.5.. 1.25 V	0.5.. 2.5 V	0.25.. 1.25 V
Current	–20.. 20 mA	–10.. 10mA	–5.. 5 mA	0.. 20 mA	0.. 10 mA	0.. 5 mA	4.. 20 mA	2.. 10 mA	1.. 5 mA	–	–	–	–

Conversion Parameters, S400 I/O

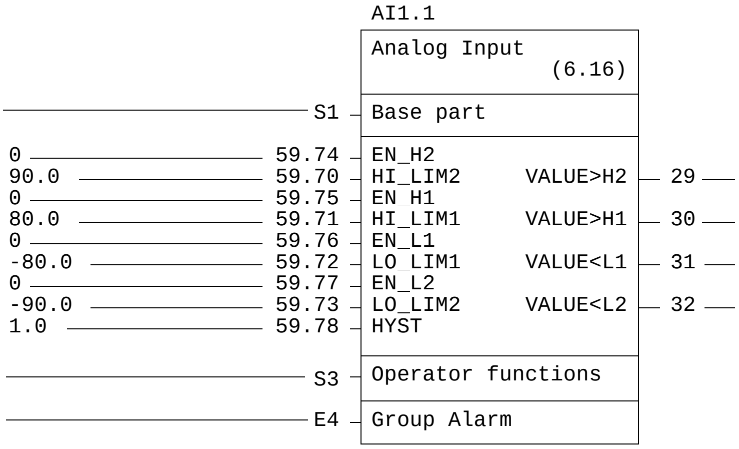
Voltage	–10.. 10 V	0.. 10 V	2.. 10 V
Current	–20.. 20 mA	0.. 20 mA	4.. 20 mA

DEADB values

Available variation limits are:

0	0.05%	0.2%	0.8%	3.2%
0.025%	0.1%	0.4%	1.6%	–1 (updated at each scan)

Limit check



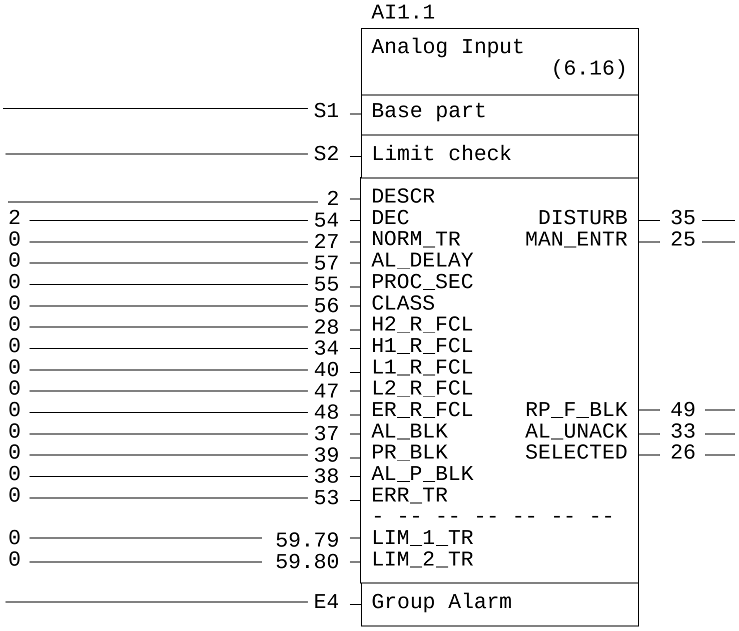
Terminal Description, Limit check

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
59.74	EN_H2	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **2**.	–
59.70	HI_LIM2	user	90.0	R(r/w)	**HI**gh **LIM**it no. **2** in engineering unit.	Accepted value HI_LIM2 > HI_LIM1.
59.75	EN_H1	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **1**.	–
59.71	HI_LIM1	user	80.0	R(r/w)	**HI**gh **LIM**it no. **1** in engineering unit.	Accepted value LO_LIM1 < HI_LIM1 < HI_LIM2.
59.76	EN_L1	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **1**.	–
59.72	LO_LIM1	user	–80.0	R(r/w)	**LO**wer **LIM**it no. **1** in engineering unit.	Accepted value HI_LIM1 > LO_LIM1 > LO_LIM2.
59.77	EN_L2	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **2**.	–
59.73	LO_LIM2	user	–90.0	R(r/w)	**LO**wer **LIM**it no. **2** in engineering unit.	Accepted value LO_LIM2 < LO_LIM1.
59.78	HYST	user	1.0	R(r/w)	**HYST**eresis for limit check in engineering units.	The hysteresis is located within each limit.
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **2**.	Cannot be affected by user.
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limitno. **1**.	Cannot be affected by user.

Terminal Description, Limit check (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **1**.	Cannot be affected by user.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **2**.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters. You may enter any information regarding the signal.
54	DEC	user	2	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.

Terminal Description, Operator functions (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
27	NORM_TR	user	0	B(r/w)	1=**NORM**al event driven updating on displays and lists in Operator Station.	0=no event driven up–dating in Operator Station.
57	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
55	PROC_SEC	user	0	I(r/w)	**PROC**ess **SE**Ction is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
56	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
48	ER_R_FCL	user	0	B(r)	**ER**ror **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating error alarms.	–
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–
38	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program or Engineering Station.	–

Terminal Description, Operator functions (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
53	ERR_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the **TR**eatmentin Operator Station of signal **ERR**ors, and operator commands.	Recommended settings 0=No event reporting 2=Event reporting incl. alarm handling
59.79	LIM_1_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and L**1** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
59.80	LIM_2_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L**2** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	Cannot be affected by user.
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	Cannot be affected by user.
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	Cannot be affected by user.
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	Cannot be affected by user.

2.3 Resistance-temperature Detector, Pt100

ABB Advant Controller 400 Series supports the RTD's with two types of input circuit boards. The two boards differs with respect to the number of wires in the connection technique, accuracy, temperature ranges and number of measuring channels.

Information of the complete range of circuit boards is given in the manuals *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide*.

2.3.1 Function

Pt100 board AIPT

Hardware Function of the Pt100 board

The Resistive temperature transducers are connected to the connecting unit which contains overvoltage protection and hf-filter.

The board contains:

- current generator for measuring current
- a multiplexer that selects input
- a measuring amplifier
- an A/D converter

The multiplexer and A/D converter are CPU controlled.

The reference channels, one accurate resistor for each current loop, calibrate the measurement inputs. If the voltage drop over the reference is out of range, the ERRor flag is set.

A red LED indicates fault or not initiated board. A yellow LED indicates A/D conversion (board channel).

Address selection: The address to be set is given in the head of the data base element.

Example: the first analog input board is located at hexadecimal address 20=0010 0000 (i.e. address bit 5 set).

Refer to the manuals *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide* for more detailed information regarding the boards.

Board Set-up Procedure

With the data base element you set up the board for the process communication program.

The board set-up procedure includes:

1. Implementation
2. Disabling
3. Board type selection
4. Self test and board change test

5. Default signal range
6. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process data communication, PDC. If you set IMPL=0 on the board, the board and the channels associated with it, are removed from the PDC's tables at the next scan.

2. Disabling

You can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all CPU load. This function will be used if a board must be unplugged during operation. If Operator Station is included in your system - see the Advant Station 500 Series Operator Station manuals.

3. Board type selection

Board type DSAI_145 has 31 inputs, 3-wire. Board type DSAI_151 has 14 inputs, 4-wire.

The full name of the board, including ”_” must be entered. TYPE must be selected when creating the elements.

Once created, a board type can be changed if the new board type has the same number of channels as the old one. If not, the data base element and all the subordinated signal elements must be deleted.

4. Self test and board change test

The board performs a self-test at 5 sec. intervals using the reference channels (on-board inputs). This test performs calibration of the inputs. At the same time, a test that enables board change during operation is performed.

5. Default signal range

As a typing aid, you may enter the normal signal range for this board, as CONV_PAR, when creating the element. This range will be the default range for all subordinated signal elements. CONV_PAR in this element is used when creating signal elements.

6. Error handling

The ERR terminal is set in AI board element, if the board is determined non-functional by the supervision function.

Typical errors are non-existent, malfunctioning or improperly strapped hardware or software or data base errors.

The ”ERR” terminal can be connected to the PC program for desired function.

ERR is reset, if hardware error, automatically within 5 seconds of replacement of the non-functional board.

The fault lamp on the board is lit when ERR is set (if the CPU still has access to the board).

Temp(Pt100) AIPTS

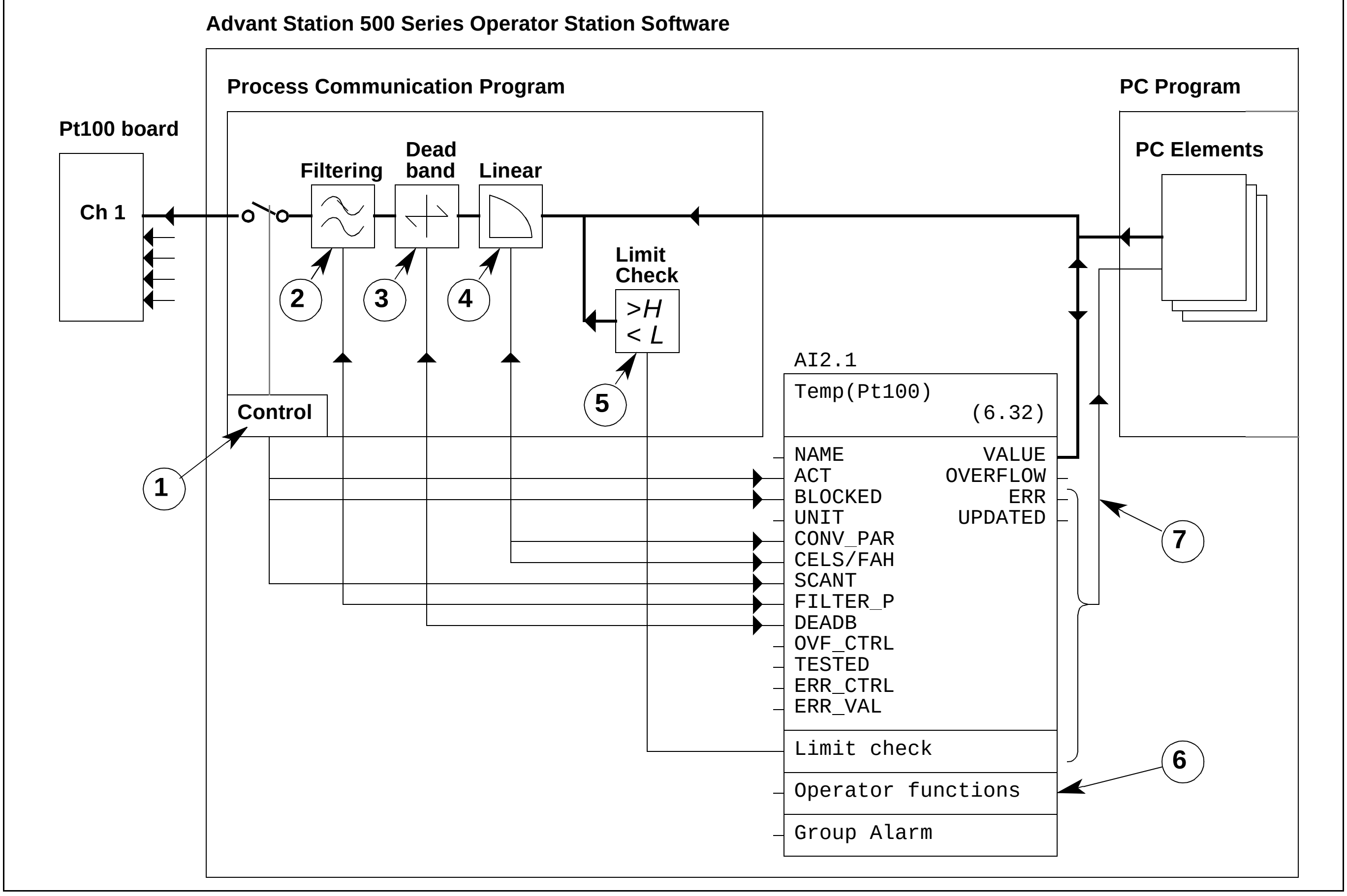
Function

The Temp(Pt100) data base element is an analog input for resistive temperature transducers of Pt100 type. With the element you control the signal processing executed by the process communication program. You can also define limit checking and the interface to the Advant Station 500 Series Operator Station system.

The system processing includes:

1. Updating
2. Filtering
3. Variation Control (deadband)
4. Linearization
5. Limit check
6. Operator Station functions
7. Error handling

Function of Temp(Pt100) Terminals



1. Updating

The temperature signal is converted and read at intervals determined by the terminal SCANTime. You should set SCANT to the requirements of your system.

If you set BLOCKED, the data acquisition stops, allowing manual entry of ”VALUE”.

To disable the data acquisition completely, you set ACTivated to 0. This excludes the input from processing.

2. Filtering

You may select software filtering of the process value. The FILTER_Parameter time constant is a value depending on SCAN-Time as indicated by the value. For example 2*T at a scan-time of 10 secs means a time constant of 20 secs. This is the time when 63% of a step change has been transferred to the ”VALUE”. The filter corresponds to a one-pole low-pass filter. FILTER_P=0 disables the software filter.

3. Variation Control

With DEADBand you select the accuracy of the updating. If the input value has not changed more than the DEADBand, since the previous update, no updating or further processing will take place. This function is valuable in reducing signal noice and unnecessary data processing.

DEADB=0 means updating at each change of input reading (i.e. using the full resolution of the A/D converter, but no unnecessary updates).

DEADB= –1 forces update at each reading.

Only in special cases need a deadband be used for this type of input. (If this is done please note that deadband is in % before linearization.)

4. Linearization

Linearization according to DIN 43760 and conversion to a temperature measurement value (Celsius or Fahrenheit).

The CELS/FAH terminal selects representation in degrees Celsius (Centigrade) or Fahrenheit. Note that UNIT should be changed separately. VALUE (and limits, DISPMAX and DISPMIN) are then expressed in this unit.

CONV_PAR selects measuring range versus resolution and optimizes the linearization.

Refer to the table for Conversion parameters for available signal ranges.

Always enter this range in centrigrades.

Two more values must be entered in CONV_PAR: (Note that values can be entered without unit or comma, but the 3 values must always be entered.) Suppression frequency should be adapted to the ambient power supply frequency to suppress AC noise.

5. Limit check

In the limit check part of the data base element you determine whether and how a limit check will be performed. The result is stored in the output terminals and is thus available to PC and other programs. If the NORM_TReat terminal is set to 1, each change in limit check status is also sent to the Advant Station 500 Series Operator Station.

The main use of this function is for Advant Station 500 Series Operator Station presentation, but it is also a convenient alternative to limit checking with PC element COMP-R.

6. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and functional unit documentation.

7. Error handling

The control function of a Pt100 input indicates errors via the ERR and OVERFLOW terminals. Four different types of errors can occur, two caused by the system, and two caused by the operator.

1. ERR is set in the Pt100 board element

   This occurs if the board function is defined non-functional by the supervision function. This can be caused by missing, mal functioning or incorrectly strapped hardware, errors in software or data base.

   ERR in a Pt100 board is copied to the error handling functions of all channels and the error flag ERR is set.

   VALUE is not updated if this occurs and the old value is retained. The LED on the board shows steady light. ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional board.

2. Out-of-range error

   For measurement range -40 °C – 40 °C:

   ERR is set if OVERFLOW is set and OVF_CTRL is 0.

   For measurement ranges -100 °C – 320 °C and -200 °C – 640 °C:

   ERR is set if the temperature value goes outside the present measurement range.

   OVERFLOW is set if the input signal goes over or under (under only for range -40 °C – 40 °C) the maximum or minimum signal range that the hardware can handle.

   Behavior of OVERFLOW, ERR and VALUE, if the temperature value goes outside the present measurement range, see the table on the following page.

   Detection of out-of-range signals can give indirect information that a transducer has been disconnected, cut electrical connections, other hardware errors or system errors on signal level.

   ERR and OVERFLOW are reset when the error is corrected.

3. ERR is set when the SERVICE terminal has been set to 0 by the operator

   The LED does not show any light.

   ERR is reset when SERVICE is set to 1 again.

4. The board was not implemented during the latest system init

   The LED on the board front shows steady light.

   ERR is reset by setting IMPL in Pt100 board.

The ERR and OVERFLOW terminals of the Pt100 element and the ERR terminal of the Pt100 board element can be connected to a PC program where the desired function may be built.

Behavior of OVERFLOW, ERR and VALUE, if the temperature value goes outside the present measurement range

Temperature Value	**OVF_CTRL**	**OVERFLOW**	**ERR**	**VALUE**
Range -40 °C – 40 °C:				
> 40.95	0	1	1	Frozen
> 40.95	1	1	0	40.95
< –40.28	0	1	1	Frozen
< –40.28	1	1	0	–40.28
Range -100 °C – 320 °C or -200 °C – 640 °C:				
> max range	0	0	1	Range max
> max range	1	0	1	Range max
< min range	0	0	1	Range min
< min range	1	0	1	Range min
>> max range	0	1	1	Frozen
>> max range	1	1	1	Range max

2.3.2 Data Base Elements

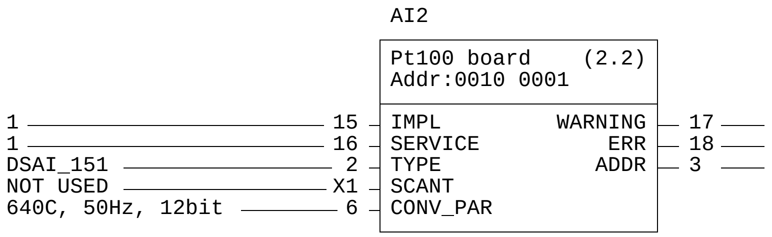
2.3.2.1 Pt100 board

Pt100 board AIPT

Summary

The Pt100 board data base element holds the data values of the terminals associated to an analog input board for temperature transducers of Pt100 type. The element is superior to the signal elements associated to the Pt100 analog input channels of the board.

Overview



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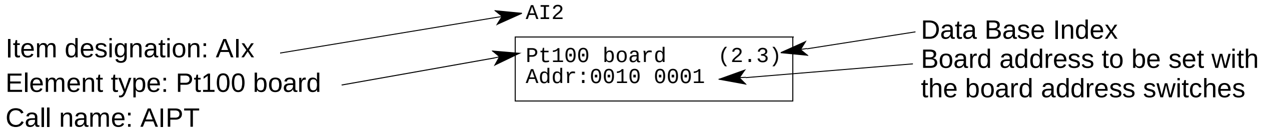


Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
15	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
16	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–

Terminal Description (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	TYPE	user	DSAI_ 151	–	Board **TYPE**: DSAI_145, DSAI_146 or DSAI_151.	TYPE must be selected when creating the elements. The full name including ”_” must be entered. When DSAI_145 or DSAI_146 is filled in on the terminal the DB element will answer with DSAI_145/146.
X1	SCANT	–	NOT USED	–	**SCAN** Time interval. Not used.	–
6	CONV_PAR	user	640C, 50Hz, 12bit	–	The normal signal range can be entered as **CONV**ersion **PAR**ameter, when creating the element. It will be used as a default value for subordinated Temp (Pt100) elements.	Refer to the table for available Conversion parameters.
17	WARNING	system	–	B(r)	Not used.	–
18	ERR	system	–	B(r)	**ERR**or flag indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

Signal Ranges

Conversion Parameter

Temperature Range	Notation as
–40..+40 °C	40 °C (1)
–100..+320 °C	320 °C
–200..+640 °C	640 °C

(1) Not for DSAI 145

The integration time of the A/D-converter is adapted to the power frequency to suppress distorsion.

Enter Power frequency: 20 Hz, 30 Hz, 50 Hz or 60 Hz. Conversion resolution: 12 bit or 13 bit.

The 3 values must be entered together. Units or comma is not necessary, but the order must be as given (Temp, Hz, bits).

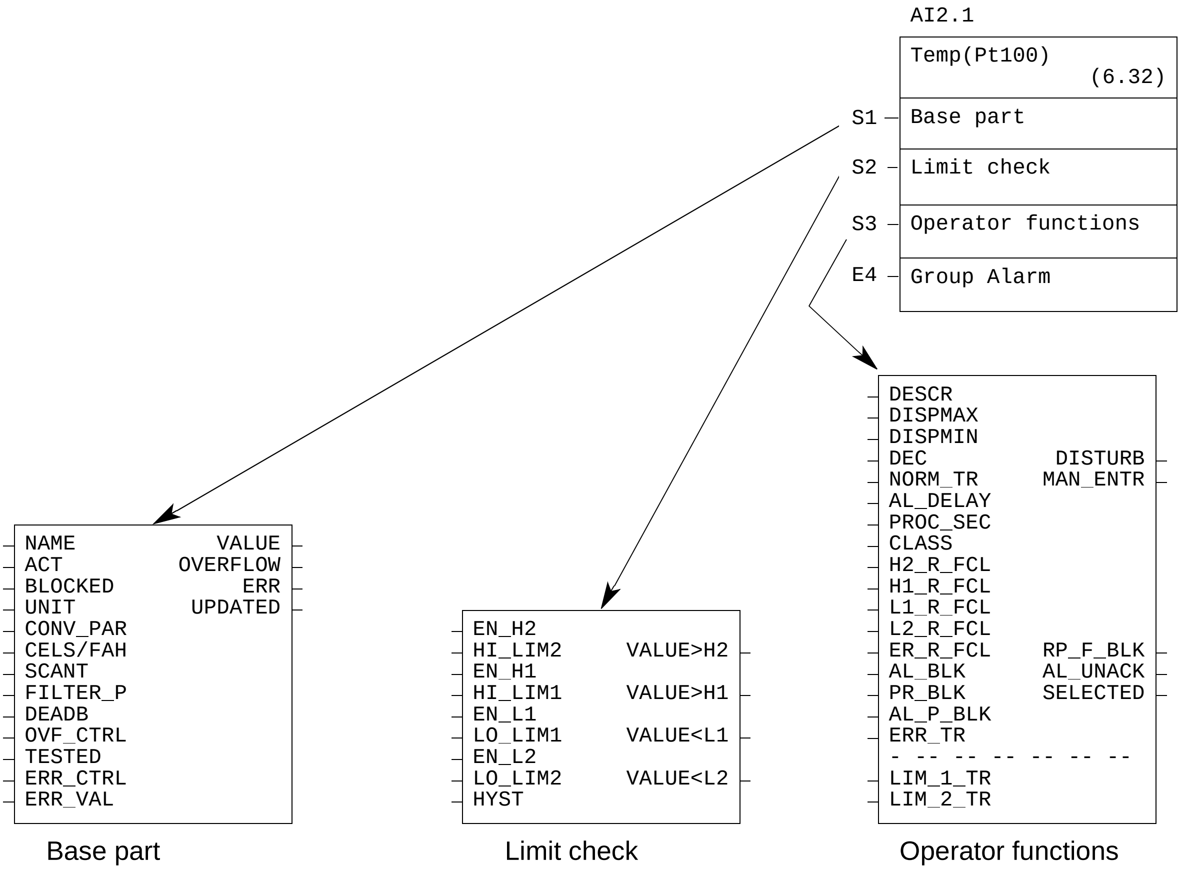
2.3.2.2 Pt100 channel

Temp(Pt100) AIPTS

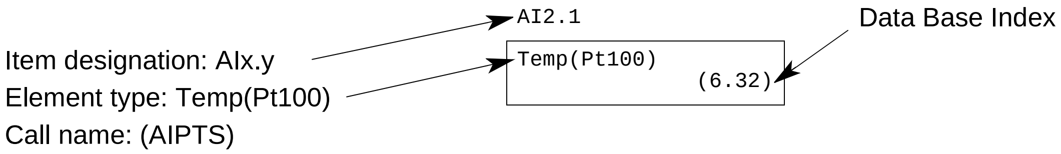
Summary

The Temp(Pt100) data base element holds the data values of the terminals associated to an analog input channel for temperature transducers of Pt100 type. The element is subordinate to the Pt100 board data base element for the input board in which the input channel is implemented. For information about the extension parts of Group Alarm see data base element Group Member.

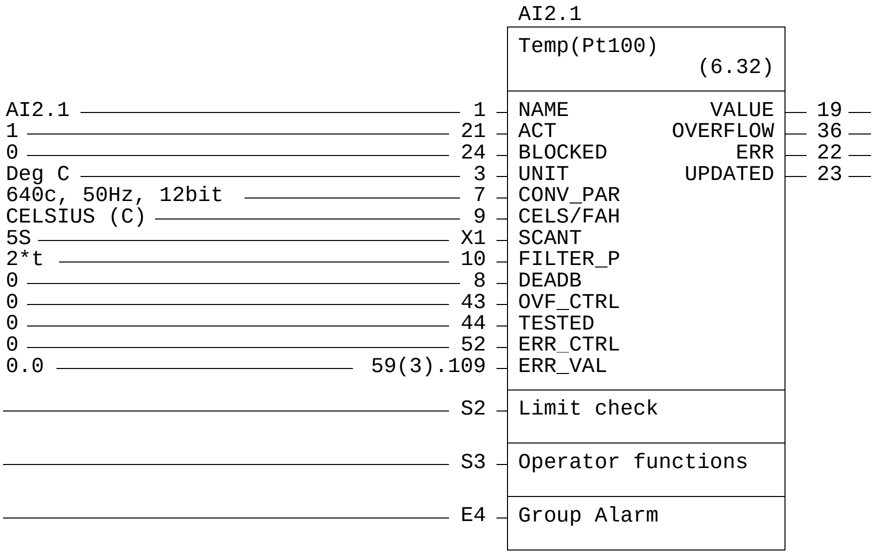
Overview



Head



Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	AIx.y	–	Each Temp(Pt100) signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed. See table regarding DB-item Designation vs. Hardware Channel.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive (scanned by the data acquisition program).	–
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal VALUE is **BLOCKED**.	–

Terminal Description, Base part (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
3	UNIT	user	Deg C	–	The measured value **UNIT** in engineering units.	Max. 6 characters shown in Operator Station and data base element.
7	CONV_PAR	user	from Pt100 board	–	The normal signal range entered as **CONV**ersion **PAR**ameter.	See the table for available Conversion parameters.
9	CELS/FAH	user	CELSIUS (C)	–	CELS/FAH can be changed to give VALUE in degrees **FAH**renheit instead of default **CELS**ius. CELSIUS (C), FAHRENHEIT (F)	–
X1	SCANT	user	5s	–	**SCAN T**ime interval for input: see Introduction, ”Allowed SCANT values”.	–
10	FILTER_P	user	2*T	–	Input **FILTER**ing in software. Filter **P**arameter depends on SCANT(T), 0,2*T, 4*T, 8*T, 16*T, 255*T.	Hardware filtering is obtained through integrating A/D-conversion.
8	DEADB	user	0	B(r/w)	Signal **DEADB**and limit percentage. If the signal variation exceeds the limit, the value will be updated.	Refer to Section ”DEADB values” for available ranges. See Function. ”3. Variation Control”.
43	OVF_CTRL	user	1	B(r/w)	**OV**er**F**low **C**on**TR**o**L**. 1=alternative overflow handling.	See Function, ”7, Error handling”.
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
52	ERR_CTRL	user	0	B(r/w)	**ERR**or **C**on**TR**o**L**. 0=Value is frozen when error occurs. 1=Value is set to the value of ERR_VAL when error occurs.	–
59(3).109	ERR_VAL	user	0.0	R(r/w)	**ERR**or **VAL**ue. Value to be set when error occurs and ERR_CTRL=1.	–
19	VALUE	system	–	R(r/w)	Process **VALUE** in engineering unit, Celsius or Fahrenheit.	Up-dated only for significant change of the input signal, but not immediately after change of CELS/FAH, FILTER_P or DEADB.
36	OVERFLOW	system	–	B(r/w)	1=dynamic indication of **OVERFLOW**.	See Function, ”7. Error handling”.
22	ERR	system	–	B(r/w)	1=Hardware or configuration **ERR**or or signal overflow.	–
23	UPDATED	system	–	B(r/w)	1=system indicates that VALUE has been **UPDATED**.	Cannot be affected by user.

Signal Ranges

Conversion Parameter

Temperature Range	Notation as	Note
–40..+40 °C	40 °C	Not for DSAI 145
–100..+320 °C	320 °C	–
–200..+640 °C	640 °C	–

The integration time of the A/D-converter is adapted to the power frequency to suppress interference.

Enter power frequency 20 Hz, 30 Hz, 50 Hz or 60 Hz. Conversion resolution. 12 bit or 13 bit.

The 3 values must be entered together. Units or comma is not necessary, but the order must be as given (Temp, Hz, bits).

Note that the power frequency must be entered on the board through strapping.

DEADB values

Available variation limits are:

0	0.025%	0.1%	0.4%	1.6%	–1 (updated at each scan)
0%	0.05%	0.2%	0.8%	3.2%	

The DEADB is set in percentage of 2 x the nominal positive max value of the used measuring range.

DB-item Designation vs. Hardware Channels

The physical board channels ch1 (DSAI 145) and ch9 (DSAI 151) are reference channels and may not be used for measured process values.

The item designations in the data base and the channel numbers of the boards are displaced according to the table.

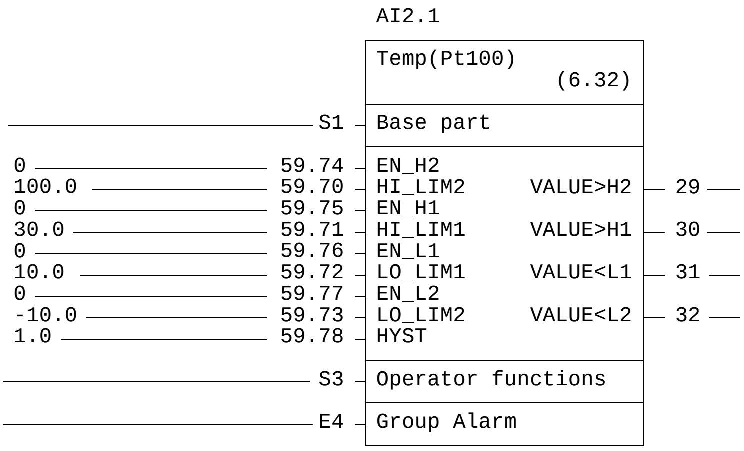
Displacement

DB-ref.	Physical board DSAI_145	Channel (ch) DSAI_151
–	1 ref	1 ref
.1	2	2
.2 : .7	3 : 8	3 : 8
–	–	9 ref
.8	9	10

Displacement

DB-ref.	Physical board DSAI_145	Channel (ch) DSAI_151
.9 : .14 : .31	10 : 15 : 32	11 : 16 : –

Limit check



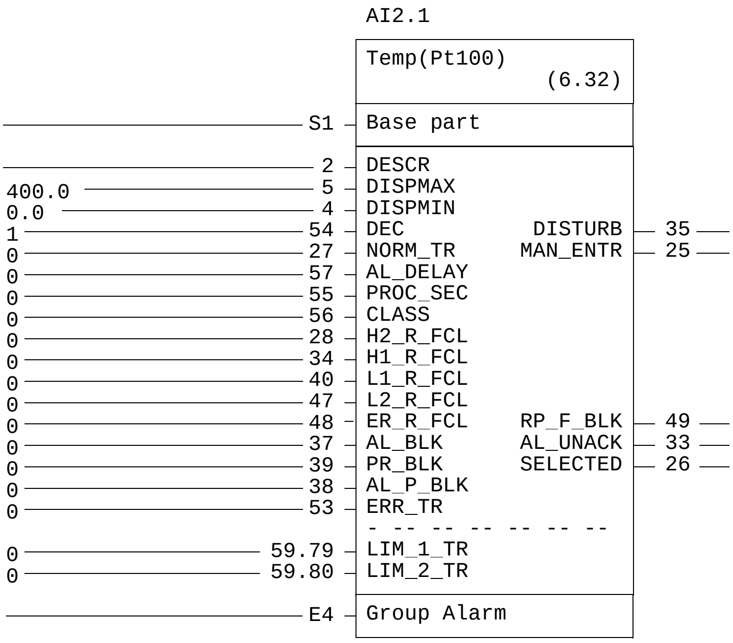
Terminal Description, Limit check

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
59.74	EN_H2	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **2**.	–
59.70	HI_LIM2	user	100.0	R(r/w)	**HI**gh **LIM**it no. **2** in engineering unit.	Accepted value HI_LIM2 > HI_LIM1.
59.75	EN_H1	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **1**.	–
59.71	HI_LIM1	user	30.0	R(r/w)	**HI**gh **LIM**it no. **1** in engineering unit.	Accepted value LO_LIM1 < HI_LIM1 < HI_LIM2.
59.76	EN_L1	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **1**.	–
59.72	LO_LIM1	user	10.0	R(r/w)	**LO**wer **LIM**it no. **1** in engineering unit.	Accepted value HI_LIM1 > LO_LIM1 > LO_LIM2.

Terminal Description, Limit check (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
59.77	EN_L2	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **2**.	–
59.73	LO_LIM2	user	–10.0	R(r/w)	**LO**wer **LIM**it no. **2** in engineering unit.	Accepted value LO_LIM2 < LO_LIM1.
59.78	HYST	user	1.0	R(r/w)	**HYST**eresis for limit check in engineering units.	The hysteresis is located within each limit.
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **2**.	Cannot be affected by user.
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **1**.	Cannot be affected by user.
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **1**.	Cannot be affected by user.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **2**.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters.
5	DISPMAX	user	400.0	R(r/w)	**MAX**imum value **DISP**layed.	Derives scaling for graphic presentation.
4	DISPMIN	user	0.0	R(r/w)	**MIN**imum value **DISP**layed.	Derives scaling for graphic presentation.
54	DEC	user	1	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
27	NORM_TR	user	0	B(r)	1=**NORM**al event driven updating on displays and lists in Operator Station.	0=no event driven updating in Operator Station.
57	AL_DELAY	user, PC	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
55	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
56	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
48	ER_R_FCL	user	0	B(r)	**ER**ror **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating error alarms.	–

Terminal Description, Operator functions (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–
38	AL_P_BLK	PC	0	B(r/w)	ALarm Period BLocK. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program.	–
53	ERR_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the **TR**eatment in Operator Station of signal **ERR**ors, and operator commands.	Recommended settings 0=No event reporting 2=Event reporting including alarm handling
59.79	LIM_1_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and L**1** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
59.80	LIM_2_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L**2** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present, but that it has been blocked in the element.	–
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

2.4 Thermocouple, TC

A single circuit board in Advant Controller 400 Series, DSAI 155, is dedicated temperature measuring with different types of thermocouples. Also available are a special connection unit and a unit for cold junction temperature measurement. All channels within a circuit board is used for one selected type of thermocouple.

2.4.1 Function

TC board AITC

Hardware function of the TC board

The process signal lines are connected in the connection unit. This unit performs over-voltage protection and hf-filtering.

The board contains

- a multiplexer that selects input
- measuring amplifier and
- an integrating A/D-converter.

The multiplexer and A/D converter are CPU controlled.

The integrating time of the A/D-converter is strap selectable. It should be choosen according to ambient noise frequency, that is power frequency. 20, 30, 50 or 60 Hz is available.

Three reference channels are included. Two are used to calibrate the A/D-converter. One must be close to 0, the other close to 10 mV, otherwise ERRor is reported. The third reference channel is used for cold junction temperature measuring -40 – +100 °C.

A red LED indicates fault or uninitiated board. A yellow LED indicates A/D conversion (board scanned).

Address selection: The address to be set is given in the head of the data base element.

Example: the third analog input board uses hexadecimal address 22=0010 0010 (i.e. address bits 5 and 1 set).

Board set-up procedure

With the data base element you set up the board for the process communication program.

The board set-up procedure includes:

1. Implementation
2. Disabling
3. Board type selection
4. Self test and board change test
5. Thermocouple selection
6. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process communication. If you set IMPL=0 on the board, The board and the channels associated with it, are removed from the PDC's tables at the next scan.

2. Disabling

You can use the SERVICE terminal to disable, and later enable the board. This saves some but not all CPU load. This function must be used if the board will be unplugged during operation. If Advant Station 500 Series Operation Station is included in your system – see Advant Station 500 Series Operation Station documentation.

3. Board type selection

DSAI_155 has 14 inputs and 1 channel for cold junction temperature, 13 bits solution and sign. At present, no other board types are available.

4. Self test and board change test

The board performs a self-test at 5 sec intervals using the reference channels (on-board inputs). This performs calibration of the inputs. At the same time, a test that enables board change during operation is performed.

5. Thermocouple selection

TC type can be changed during operation. For available thermocouple types refer to table for Thermocouple types.

Linearization is performed for each TC type. The system automatically selects the appropriate amplification for the selected TC type to obtain the full nominal range of the thermocouple.

For the T and R type you can select T385 resp. R1680 to get better resolution on condition that the differential temperature between measuring point and cold junction not exceeds 385 °C resp. 1680 °C. Thereby a more suitable amplification range is used in the measuring amplifier.

6. Error handling

The ERR is set in the TC board element if the board is determined non-functional by the supervision function. Typical errors are non-existing, malfunctioning or improperly strapped hardware or software or database errors. Missing or improperly adjusted reference or cold junctions channels are errors special for this board.

The ERR terminal can be connected to the PC program for desired function. ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional board.

The fault lamp on the board is lit when ERR is set (if the CPU still has access to the board).

Thermocouple AITCS

Function

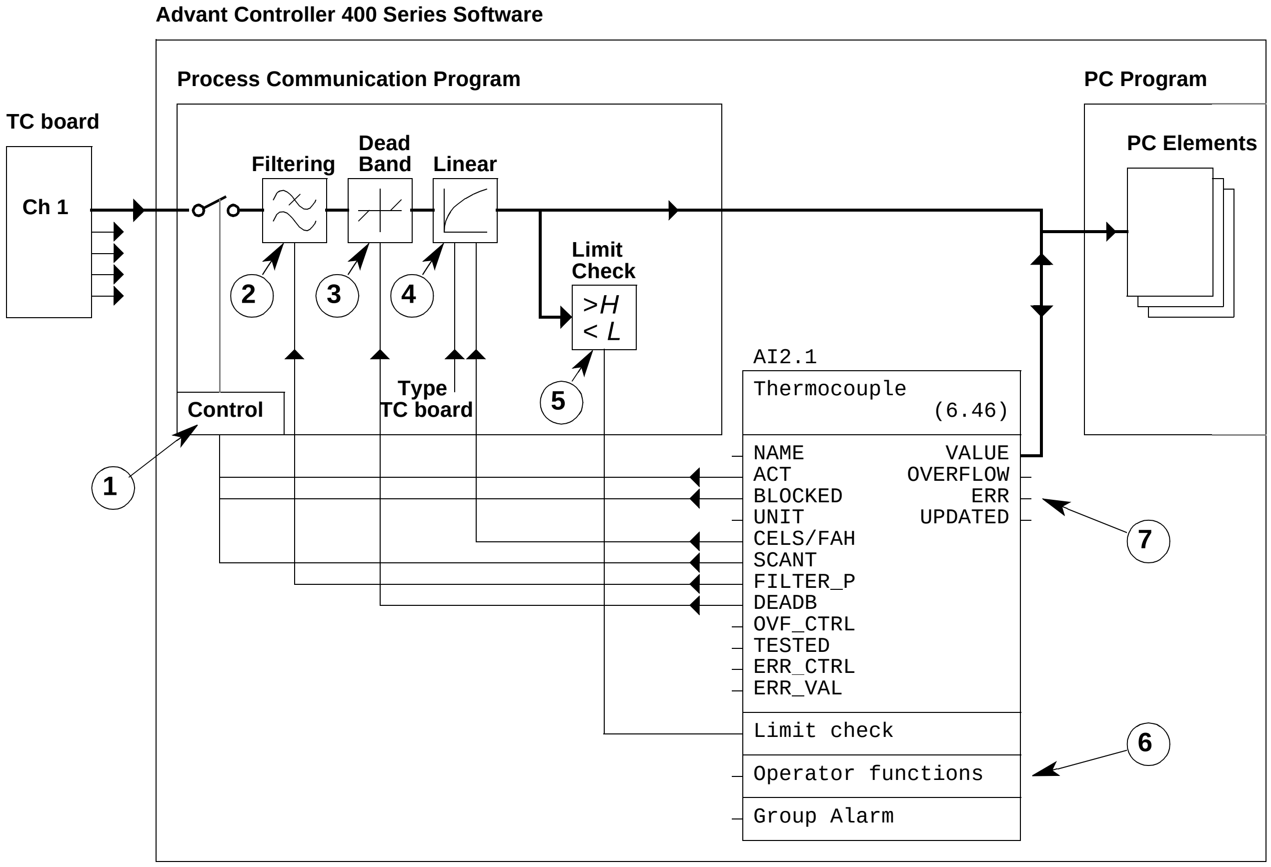
The Thermocouple data base element is used for analog input signals from thermocouples. The signal handling carried out by the process communication program is controlled by the Thermocouple element. Limit check and connection to Advant Station 500 Series Operator Station may also be defined in the Thermocouple element.

The signal processing controlled by the element includes:

1. Updating
2. Filtering
3. Variation Control (deadband)
4. Linearization
5. Limit Check
6. Operator Station functions
7. Error handling

The figure below illustrates this process.

Function of Thermocouple Terminals



1. Updating

The temperature signal is converted and read at intervals determined by the terminal SCANTime. You should set SCANT to the requirements of your system.If you set BLOCKED, the data acquisition stops, allowing manual entry of VALUE. To disable the data acquisition completely, you set ACTivated to 0. This excludes the input from processing.

2. Filtering

You may select software filtering of the process value. The FILTER_Parameter time constant is a quantity including SCANTime. For example 2*T at a scan-time of 10 seconds means a time constant of 20 seconds. The filter corresponds to a one-pole low-pass filter. FILTER_P=0 disables the software filter.

3. Variation control

With DEADBand terminal you select the accuracy of the up-dating. If the input value has not changed more than the DEADBand, since the previous update, no updating or further processing will take place. This function is valuable to reduce signal noise and unnecessary data processing.

DEADBand=0 means updating at each change of input reading (i.e. using the full resolution of the A/D converter, but no unnecessary updates).

DEADBand= –1 forces update at each reading.

For this input a deadband is needed only in special cases (if this is done please note that deadband is in % before linearization).

NOTE

> The working range of the thermocouple is less than the working range of the A/D-converter. The deadband must therefore be calculated as percent of a fictive range. The following table shows the fictive range for different types of thermocouples.

Fictive Range for Different Types of Thermocouples

Type of thermocouple		B	C	E	J	K	R	R1680	S	T	T385
Fictive temperature for calculating of deadband	° C	5150	4890	2050	2700	3910	6550	3290	3700	1500	750
	° F	9300	8835	3720	4890	7070	11820	5955	6690	2730	1380

4. Linearization

Linearization according to selected TC TYPE and conversion to a temperature measurement value (Celsius or Fahrenheit).

The CELS/FAH terminal is used to select representation in degrees Celsius (Centigrade) or Fahrenheit. Note that UNIT should be changed separately. VALUE (and limits DISPMAX and DISPMIN) are expressed in this unit. The conversion uses the TC TYPE terminal in the TC Board element. The terminal is common to all channels on a board.

5. Limit check

In the limit check part of the element you determine if and how limit checking will be performed. The result is presented in the output terminals and is thus available to PC and other programs. If the NORM_TReat terminal is set to 1, each change in limit check status is also sent to the Advant Station 500 Series Operator Station . The main use of this function is for Advant Station 500 Series Operator Station presentation, but it is also a convenient alternative to limit checking with PC element COMP-R.

6. Operator Station function

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and function unit documentation.

7. Error handling

The control function of a thermocouple input indicates errors via the ERR and OVERFLOW terminals.
Four different types of errors can occur, two caused by the system, and two caused by the operator.

1. ERR is set in the TC board element

This occurs if the board function is defined non-functional by the supervision function. This can be caused by missing, malfunctioning or incorrectly strapped hardware, errors in software or data base.

ERR in a TC board is copied to the error handling functions of all channels and the error flag ERR is set.

VALUE is not updated if this occurs and the old value is retained. The LED on the board shows steady light. ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional board.

2. Out-of-range error

OVERFLOW is set if the input signal goes over or under the maximum or minimum signal range that the hardware can handle.

ERR is set if the temperature value goes outside the present measurement range and if not OVERFLOW is set at the same time.

VALUE is set to the maximum resp. minimum value if the temperature value goes outside the present measurement range.

If OVERFLOW is set at the same time, the out-of-range handling will be the same as for R1680 and T385.

NOTE

> Out-of-range error for R1680 and T385: ERR is set if the temperature value reaches “underflow” or “overflow”. Different ways to handle this can be selected through the OVF_CTRL terminal. If OVF_CTRL=1 then VALUE is set to the maximum or minimum value when “overflow” or “underflow” repectively, is reached. OVERFLOW is set. The ERR terminal is not affected.
>
> If on the other hand, OVFCTRL=0 then the VALUE is retained at the preceding value if “overflow” or “underflow” occurs. OVERFLOW is set and ERR is also set.

Detection of out-of-range signals can give indirect information that a transducer has been disconnected or broken, cut electrical connections, other harware errors or system errors on signal level.

ERR and OVERFLOW are reset when the error has been dealt with.

3. ERR is set when the SERVICE terminal of the TC board has been set to 0 by the operators

The LED does not show any light. ERR is reset when SERVICE is set to 1 again.

4. The board was not implemented during the latest system init

The LED on the board front shows steady light. ERR is reset by setting IMPL in TC board.

The ERR and OVERFLOW terminals of the Thermocouple element and the ERR terminal of the TC board element can be connected to a PC program where the desired function may be built.

2.4.2 Data Base Elements

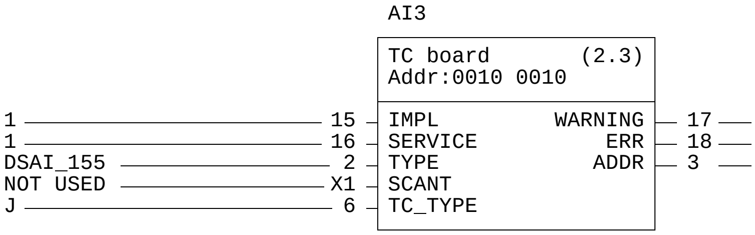
2.4.2.1 TC board

TC board AITC

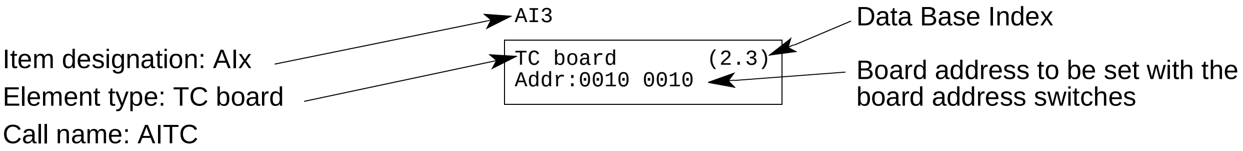
Summary

The TC board data base element holds the data values of the terminals associated to a thermocouple input board. The element is superior to the thermocouple signal elements associated to the input channels in the board.

Overview



Head



Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
15	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
16	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–

Terminal Description (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
2	TYPE	user	DSAI_ 155	–	No other board **TYPE** available at present.	–
X1	SCANT	–	NOT USED	–	**SCANT**ime interval. Not used.	–
6	TC_TYPE	user	J	–	**T**hermo**C**ouple **TYPE**: B, C, E, J, K, R, R1680, S, T and T385.	–
17	WARNING	system	–	B(r)	Not used.	–
18	ERR	system	–	B(r)	**ERR**or flag indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

Available Thermocouple types

Code	**Thermocouple Type**	**Temperature Range**	**References**
B	Platinum - 30% Rhodium/Platinum-6% Rhodium, Pt-30Rh/Pt-6Rh	40 °C to 1820 °C 104 °F to 3308 °F	IEC 584-1 1977
C	Tungsten - 5% Rhenium/Tungsten-26% Rhenium, W-5Re/W-26Re	0 °C to 2300 °C 32 °F to 4172 °F	Hoskins Mfg. Co type C. This type is not approved by IEC
E	Nickel - 10% Chromium / Copper - Nickel, Ni - 10% Cr / Cu - /Ni	–270 °C to 870 °C –454 °F to 1598 °F	IEC 584-1 1977
J	Iron/Copper - Nickel Fe/Cu-Ni	–210 °C to 1200 °C –346 °F to 2192 °F	IEC 584-1 1977
K	Nickel - Chromium/Nickel-Aluminium , Ni-Cr/Ni-Al	–270 °C to 1372 °C –454 °F to 2500 °F	IEC 584-1 1977 (DIN 43710 1977)
R	Platinum - 13% Rhodium/Platinum Pt-13Rh/Pt	–50 °C to 1768 °C –58 °F to 3214 °F	IEC 584-1 1977
R1680	Platinum - 13% Rhodium/Platinum Pt-13Rh/Pt	–50 °C to 1680 °C –58 °F to 3056 °F	IEC 584-1 1977
S	Platinum - 10% Rhodium/Platinum Pt-10Rh/Pt	–50 °C to 1768 °C –58 °F to 3214 °F	IEC 584-1 1977 (DIN 43710 1977)
T	Copper/Copper - Nickel Cu/Cu-Ni	–270 °C to 400 °C –454 °F to 752 °F	IEC 584-1 1977

Available Thermocouple types (Continued)

Code	Thermocouple Type	Temperature Range	References
T385	Copper/Copper - Nicke Cu/Cu-N	–270 °C to 385 °C –454 °F to 725 °F	IEC 584-1 1977

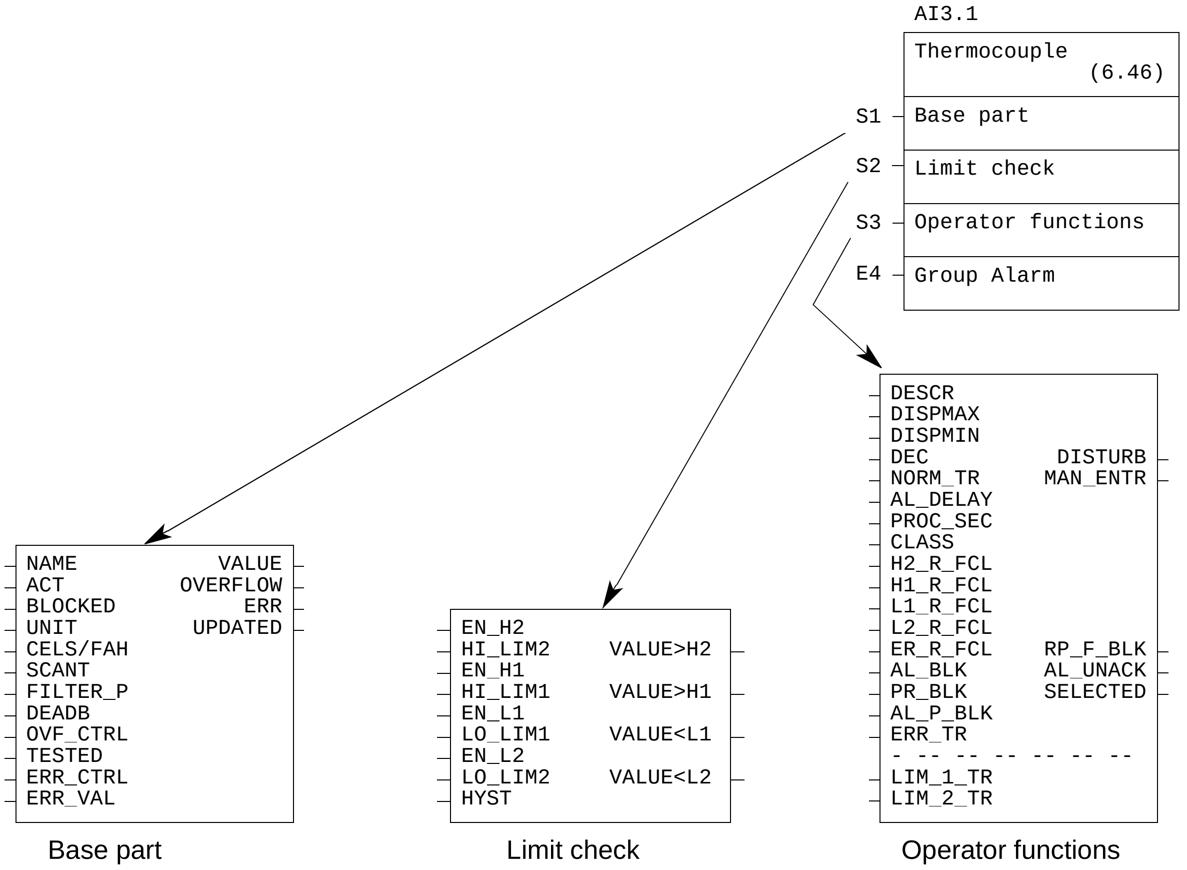
2.4.2.2 TC channel

Thermocouple AITCS

Summary

The Thermocouple data base element holds the data values of the terminals associated to an analog input channel for temperature transducers of thermocouple. The element is subordinate to the TC board data base element. For information about the extension parts of Group Alarm see data base element Group Member.

Overview



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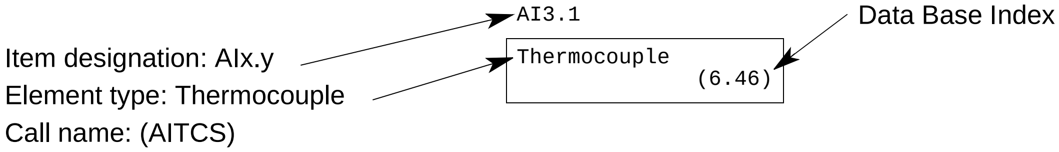
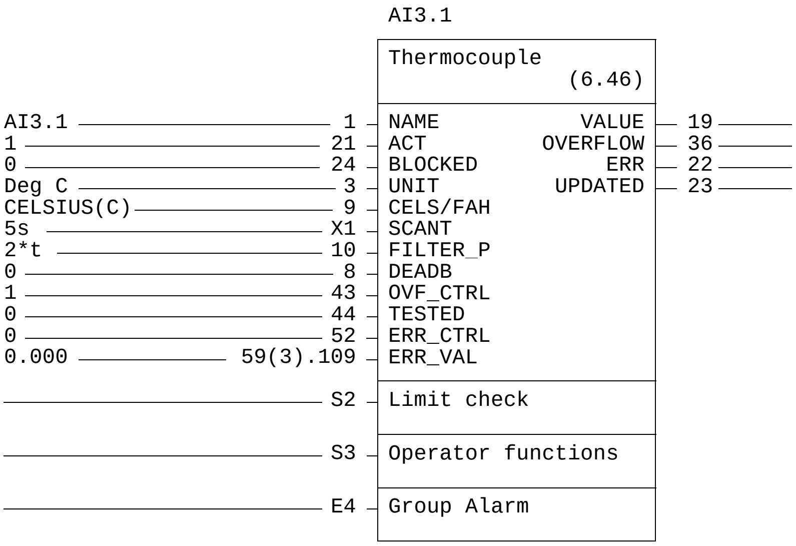


Base part



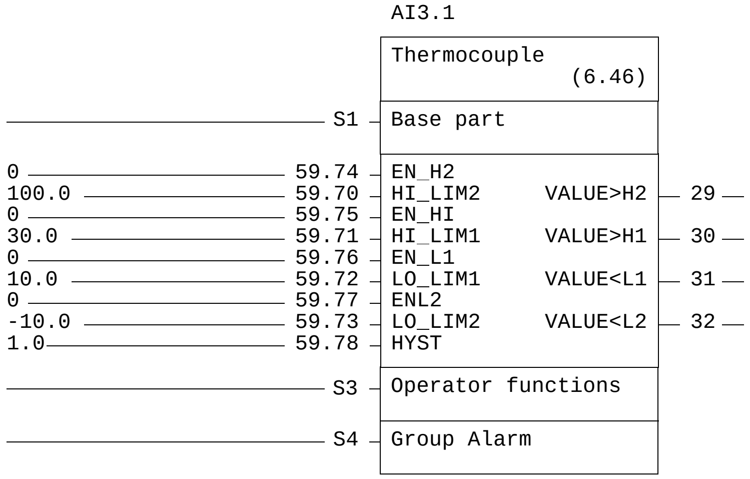
Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	AIx.y	–	Each Thermocouple signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive 0=the signal is spare	–
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
3	UNIT	user	Deg C	–	The measured value **UNIT** in engineering units.	Max. 6 characters shown in Operator Station and data base element.

Terminal Description, Base part (Continued)

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
9	CELS/FAH	user	CELSIUS (C)	–	CELS/FAH can be changed to give VALUE in degrees **FAH**renheit instead of default **CEL**sius. CELSIUS (C), FAHRENHEIT (F)	–
X1	SCANT	user	5 s	–	**SCAN T**ime interval for input: see Introduction, section "Allowed SCANT values".	–
10	FILTER_P	user	2*T	–	Input filtering in software. **FILTER P**arameter depends on SCANT(T), 0,2*T, 4*T, 8*T, 16*T, 255*T.	Hardware filtering is obtained through integrating A/D-conversion.
8	DEADB	user	0	–	Signal **DEADB**and limit percentage. If the signal variation exceeds the limit, the value will be updated.	Available limits: 0.0%, 0.025%, 0.05%, 0.1%, 0.2%, 0.4%, 0.8%, 1.6%. 3.2%, –1 (updated at each scan. See Function: "3. Variation Control".
43	OVF_CTRL	user	1	B(r/w)	1=alternative **OV**er**F**low **C**on**TR**o**L**.	See Function "7. Error handling".
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
52	ERR_CTRL	user	0	B(r/w)	**ERR**or **C**on**TR**o**L**. 0=Value is frozen when error occurs. 1=Value is set to the value of ERR_VAL when error occurs.	–
59(3).109	ERR_VAL	user	0.0	R(r/w)	**ERR**or **VAL**ue. Value to be set when error occurs and ERR_CTRL=1.	–
19	VALUE	system	–	R(r/w)	Signal **VALUE** in engineering unit, Celsius or Fahrenheit.	–
36	OVERFLOW	system	–	B(r/w)	1=dynamic indication of **OVERFLOW**	See "7. Error handling".
22	ERR	system	–	B(r/w)	1=hardware or configuration **ERR**or.	–
23	UPDATED	system	–	B(r/w)	1=system indicates that the value has been **UPDATED**.	Cannot be affected by user.

Limit check



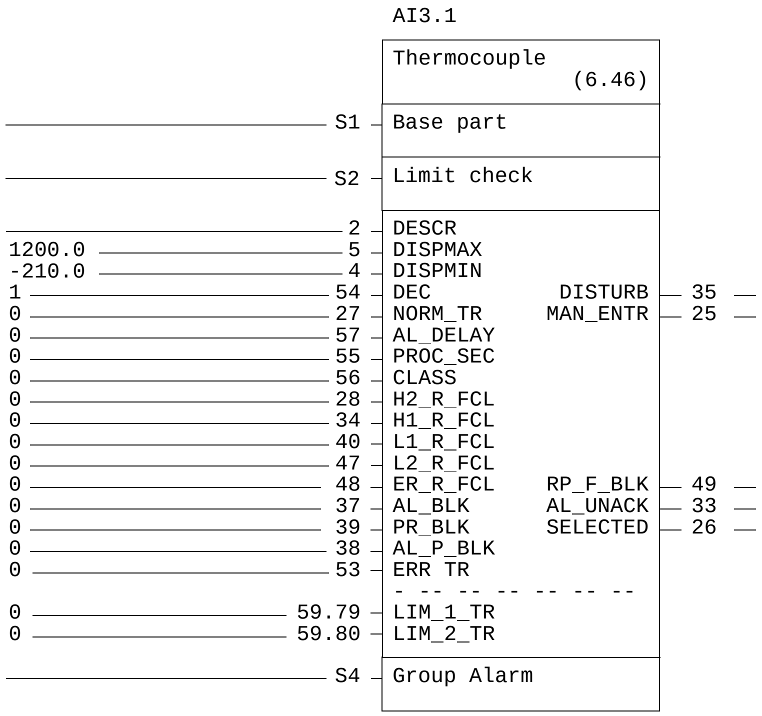
Terminal Description, Limit check

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
59.74	EN_H2	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **2**.	–
59.70	HI_LIM2	user	100.0	R(r/w)	**HI**gh **LIM**it no. **2** in engineering unit.	Accepted value HI_LIM2 > HI_LIM1.
59.75	EN_H1	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **1**.	–
59.71	HI_LIM1	user	30.0	R(r/w)	**HI**gh **LIM**it no. **1** in engineering unit.	Accepted value LO_LIM1 < HI_LIM1 < HI_LIM2.
59.76	EN_L1	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **1**.	–
59.72	LO_LIM1	user	10.0	R(r/w)	**LO**wer **LIM**it no. **1** in engineering unit.	Accepted value HI_LIM1 > LO_LIM1 > LO_LIM2.
59.77	EN_L2	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **2**.	–
59.73	LO_LIM2	user	–10.0	R(r/w)	**LO**wer **LIM**it no. **2** in engineering unit.	Accepted value LO_LIM2 < LO_LIM1.
59.78	HYST	user	1.0	R(r/w)	**HYST**eresis for limit check in engineering units.	The hysteresis is located within each limit.
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **2**.	Cannot be affected by user.

Terminal Description, Limit check (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **1**.	Cannot be affected by user.
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **1**.	Cannot be affected by user.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **2**.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters. You may enter any information regarding the signal.

Terminal Description, Operator functions (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
5	DISPMAX	user	1200.0	R(r/w)	**MAX**imum value **DISP**layed on screen.	Derives scaling for screen.
4	DISPMIN	user	–210.0	R(r/w)	**MIN**imum value **DISP**layed on screen.	Derives scaling for screen.
54	DEC	user	1	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
27	NORM_TR	user	0	B(r/w)	1=**NORM**al event driven updating on displays and lists in Operator Station.	0=no event driven updating in Operator Station.
57	AL_DELAY	user, PC	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
55	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
56	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
48	ER_R_FCL	user	0	B(r)	**ER**ror **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating error alarms.	–
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–

Terminal Description, Operator functions (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
38	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program or Engineering Station.	–
53	ERR_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the **TR**eatment in Operator Station of signal **ERR**ors, and operator commands.	Recommended settings 0=No event reporting 2=Event reporting incl. alarm handling
59.79	LIM_1_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and L**1** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
59.80	LIM_2_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L**2** **LIM**it **TR**ansgressions.	Recommended settings 0=No event reporting 3=Event reporting, no alarm handling 4=Event reporting, incl. alarm handling
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

2.5 Pulse Input

Quantity and length measurement by pulse counting in the range 0 - 40 Hz is performed with a variant of the functional unit Analog Input. In these applications a digital input board DSDP 110 is used for pulse encoder connection and pulse counting.

The Advant Controller 400 Series system also provides other "high frequency" measurement boards for positioning and speed measuring applications.

2.5.1 Function

Pulse board PULSE

Hardware function of the Pulse board

The process signal lines are connected in the connection unit DSTD 150. This unit contains overvoltage protection for the inputs and fuses for power distribution lines. The DSDP_110 board contains 4 groups of inputs, each with 7 pulse counting inputs. In addition there is a special input that controls the direction of count (up or down) for all inputs in each group.

A microprocessor on the board reads the inputs, handles filtering and counts the filtered pulses in a register.

A red LED indicates a fault or unindicated board. 32 yellow LEDs indicate the state of the inputs.

For board data and strappings, please refer to Advant Controller 400 Series documentation.

Board Set-up Procedure

The board set-up procedure includes:

1. Implementation
2. Board type selection
3. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process communication. If you set IMPL=0 the board, and the channels associated with it, are removed from the PDC’s tables at the next scan.

2. Board type selection

Only one board type is available in standard Advant Controller 400 Series. This type is preselected: DSDP_110.

3. Error handling

The ERR terminal is set in Pulse board element, if the board is determined non-functional by the control function.

Indicated errors are non-existent, malfunctioning or improperly strapped hardware or software or data base errors.

The ”ERR” terminal can be connected to the PC program for desired function.

ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional board. The board must be resynchronised.

The fault lamp on the board is lit when ERR is set (if the CPU still has access to the board).

Pulse PULSES

Function

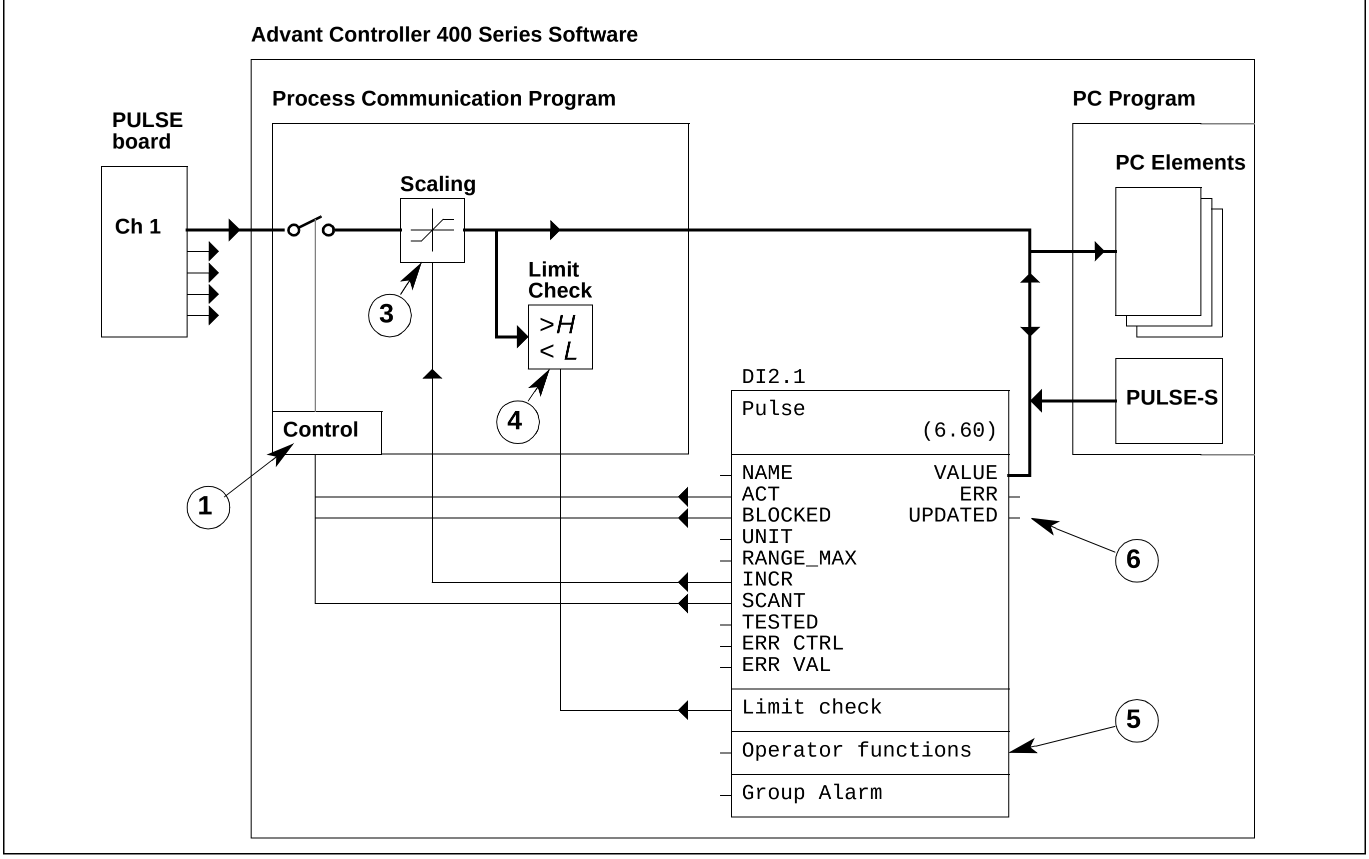
The Pulse data base element defines a pulse input signal. With the data base element you control the signal processing executed by the process communication program. You can also define limit checking and the interface to the Operator Station system.

The signal processing includes:

1. Synchronization
2. Updating
3. Scaling
4. Limit Check
5. Operator Station functions
6. Error handling

The figure below illustrates this process.

Function of Pulse Terminals



1. Synchronization

After system init or ”overflow ERRor” synchronization must be done with the help of the PC element PULSE-S.

Synchronization can be made against any value (position) within the 0 to RANGEMAX area. The value must be a multiple of INCR.

2. Updating

The analog signal is converted and read at intervals determined by the terminal SCANTime. You should set SCANT to the requirements of your system.

If you set BLOCKED, the data acquisition stops, allowing manual entry of ”VALUE”.

To disable the data acquisition completely, you set ACTivated to 0. This excludes the input from processing.

3. Scaling

All values are used in the system as engineering units.

Scaling from physical pulses to engineering units is entered as INCR, meaning the value corresponding to one increment pulse in desired unit.

In total, the system can count up to 65536 pulses. Maximum possible range is therefore 65536·INCR. Outside this range ERR is obtained. RANGEMAX must be selected below this value, and RANGEMAX must be a multiple of INCR.

Measurement range is 0 to RANGEMAX. RANGEMAX has two functions:

1. to center the pulse-counter around the measurement range midpoint (RANGEMAX/2).

   The number of pulses that can be counted is 32767 above and below this midpoint. Outside this range ERR is obtained.

2. to select a range (DISPMIN-DISPMAX) for display on Operator Station Bargraph display.

These relations are described in the figure for Range DISPMIN-DISPMAX at the end of this element description.

Expressed in engineering units this means that out-of-range-ERRor will occur below:

VALUE<RANGEMAX/2 –32768*INCR

and above

VALUE>RANGEMAX/2 +32767*INCR

Usually the working measurement range is much wider than the needed one.

Negative values can thus be obtained and are handled correctly within the above limit.

The engineering unit can be entered in UNIT, for documentation and display purposes.

4. Limit check

In the Limit check part of the data base element you determine whether and how a limit check will be performed. The result is stored in the output terminals and is thus available to PC and other programs. If the NORM_TReat terminal is set to 1 each change in limit check status is also sent to the Advant Station 500 Series Operator Station.

The main use of this function is for Operator Station presentation, but it is also a convenient alternative to limit checking with PC element COMP-R.

5. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and Functional Unit documentation.

6. Error handling

If ”ERR” occurs, ”VALUE” will not be updated but the last value is retained. The signal ”ERR” terminal and the ”ERR” terminal of the Pulse board element can be connected to the PC program for desired function.

ERR for a Pulse signal has 3 main causes, 1 system and 2 operator causes:

1. ”ERR” in Pulse board is set. This occurs if the board is determined non-functional.

   ERR is reset, if hardware error, automatically within 5 s of replacement of the non-functional board. Resynchronization must be made.

2. Out-of-range. ERR is set for overflow in the pulse-counter. After out-of-range, synchronization must be done for the element to start working again. Out-of-range (ackumulator overflow) takes place well above DISPMAX and below DISPMIN (see scaling, above).

   ERR is reset when error condition disappears (osynchronization is done).

3. ERR is set if IMPL was not set for the board during last system init.

   Thus, a PC program could treat the condition ”signal-ERR=1 and board-ERR=1” as hardware (board) error, and the condition ”signal-ERR=1 and board-ERR=0” as signal error (out-of-range, missing direction indication..).

   It is practical, however, to use Limit check part of the DBE to check for out-of-range problems. Such problems may be caused by mechanical or transducer error, or missing or faulty direction indication or synchronization signal.

Range example

If the input of one pulse from the pulse transducer represents 0.2 mm movement, and total movement is 3.5 meter, set:

INCR=0.2 (or 0.0002)

UNIT=mm (or meter)

RANGEMAX to maximum value expected, i.e. 3500 (or 3.5)

VALUE will vary between 0 and 3500 (0 - 3.5) if the pulse counting is started in the bottom position.

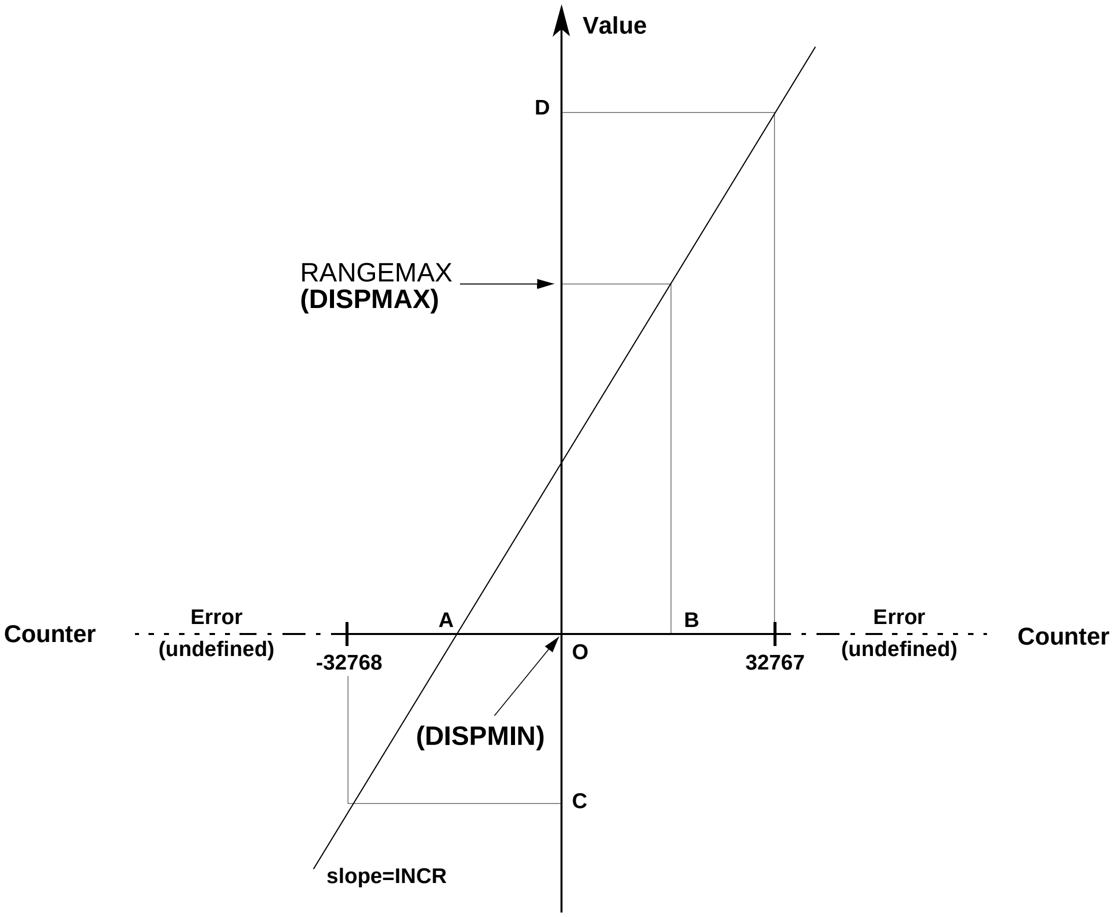
17500 pulses will correspond to full specified movement.

Maximum possible range is 65536·0.2 mm=13.107 m.

Synchronization (resetting) of the pulse counter is done by the PC element PULSE-S with the value given at PC-element terminal SYNC-V. Synchronization can be done to a value between 0 and RANGEMAX (DISPMAX). The value must be a multiple of INCR.

Advant Station 500 Series Operator Station display will handle only ”unipolar range”: positive VALUES if RANGEMAX (DISPMAX) is positive and negative if RANGEMAX is negative. To display a range through zero the PULSE element can be connected, in a PC program, to an AI Calculated element where desired DISP-range can be selected.

Range DISPMIN-DISPMAX



Range DISPMIN-DISPMAX is nominal measuring range

A-B is actually used pulse-counter capacity.

C-D is possible measuring range (maximum pulse-counter capacity).

2.5.2 Data Base Elements

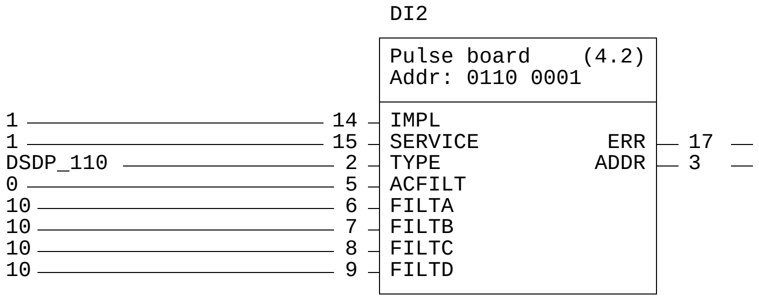
2.5.2.1 Pulse board

Pulse board PULSE

Summary

The Pulse board data base element holds the data values of the terminals associated to pulse counter boards of type DSDP 110 and similar boards. The element is superior to the signal elements associated to the pulse counter input channels in the board.

Overview



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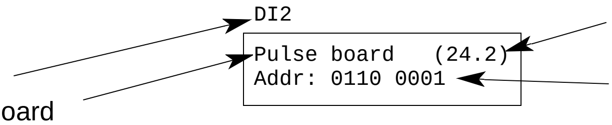


Item designation: DIx
Element type: Pulse board
Call name: PULSE

Data Base Index

Board address to be set with the board address switches

Terminal Description

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
14	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–

Terminal Description (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
15	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–
2	TYPE	user	DSDP_ 110	–	Board **TYPE**: DSDP_110	TYPE must be selected when creating the element. The full name including ”_” must be entered.
5	ACFILT	user	0	–	1=**FILT**er time is doubled for signal transition to 0. Suitable for AV-signals (irrelevant for DSDP_110).	–
6	FILTA	user	10	–	**FILT**er time for first group of 8 channels. 0..63 ms.	–
7	FILTB	user	10	–	**FILT**er time for second group of 8 channels. 0..63 ms.	–
8	FILTC	user	10	–	**FILT**er time for third group of 8 channels. 0..63 ms.	–
9	FILTD	user	10	–	**FILT**er time for fourth group of 8 channels. 0..63 ms.	–
17	ERR	system	–	–	**ERR**or flag indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

2.5.2.2 Pulse channel

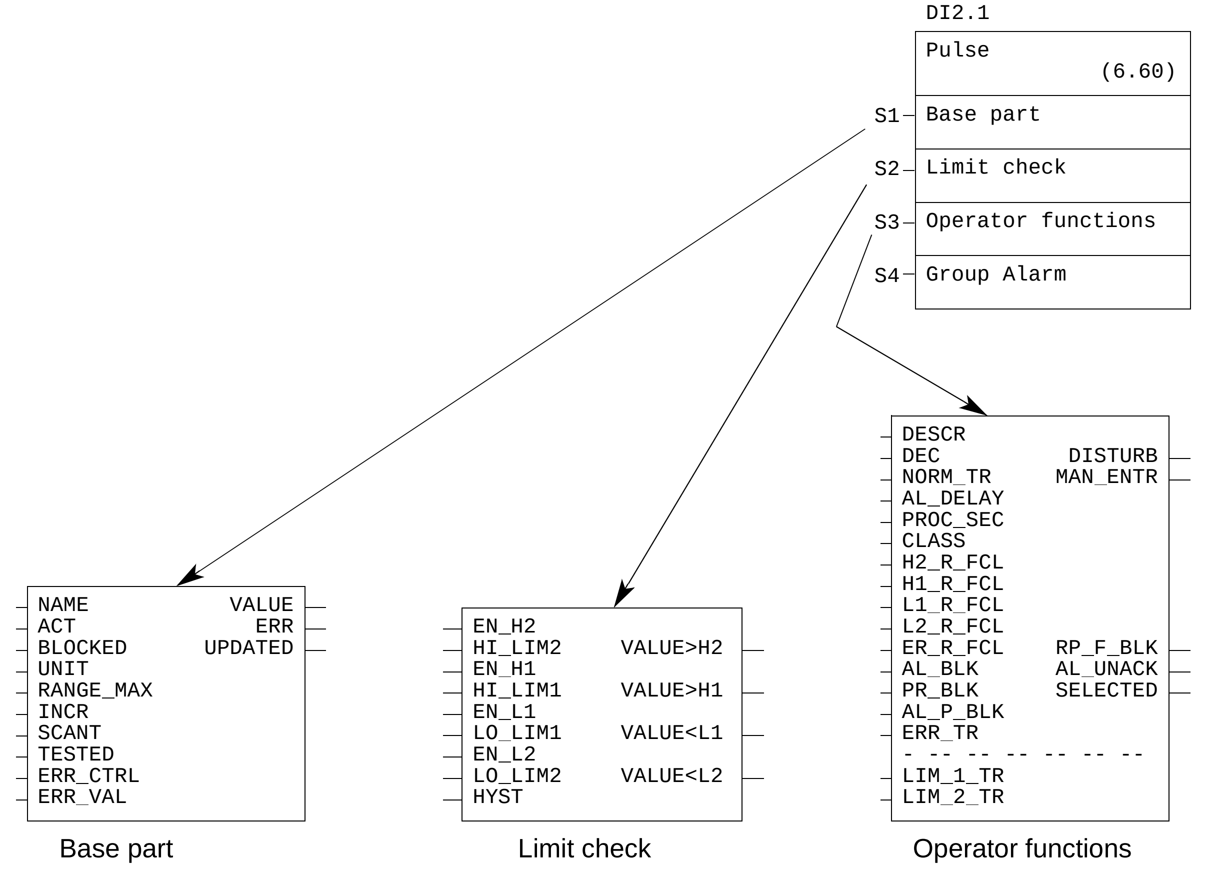
Pulse PULSES

Summary

The Pulse data base element holds the data values of the terminals associated to a pulse input channel (for DSDP110 and similar boards). The element is subordinate to the Pulse board element associated to the board in which the input channel is implemented.

For information about the extension parts of Group Alarm see data base element Group Member.

Overview



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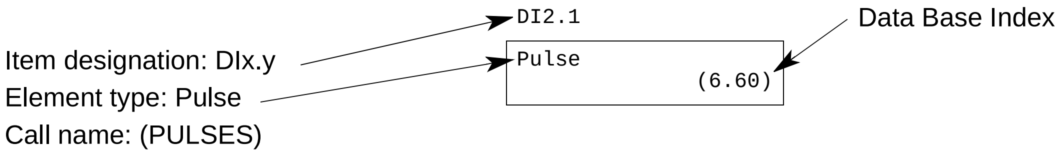
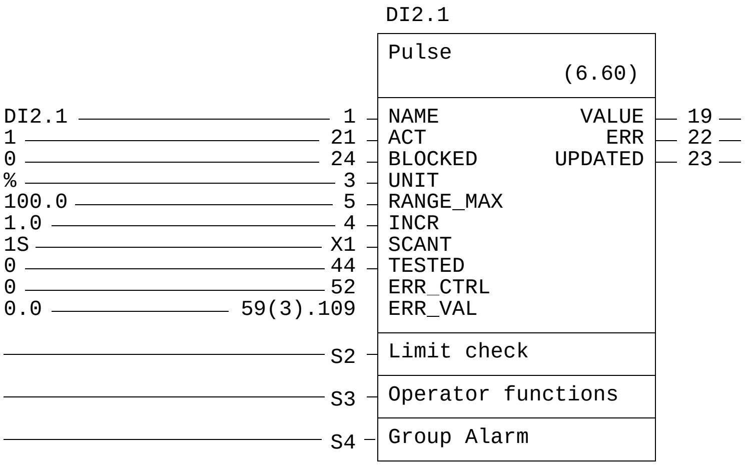


Base part



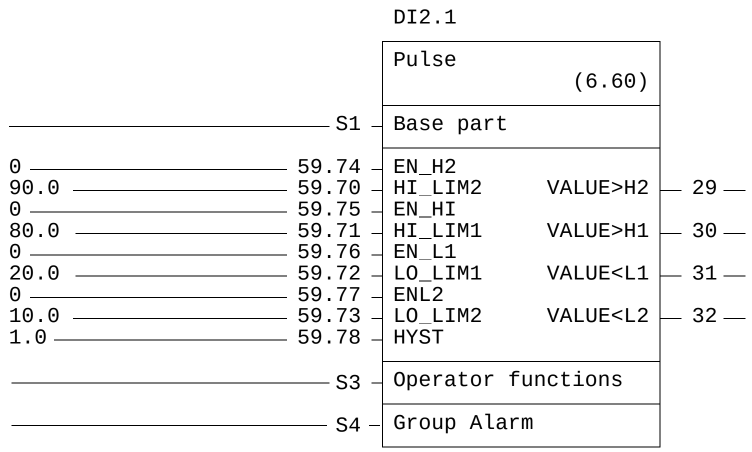
Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DIx.y	–	Each Pulse signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive 0=the signal is spare	–
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
3	UNIT	user	%	–	The signal **UNIT** in engineering unit.	Max. 6 characters shown in Operator Station and data base element.
5	RANGEMAX	user	100.0	B(r/w)	**RANGE MAX**imum. Maximum value to be measured.	Derives scaling of register and display scaling. RANGEMAX must be a multiple of INCR.

Terminal Description, Base part (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
4	INCR	user	1.0	B(r/w)	**INCR**ement. The value of one pulse expressed in engineering unit.	Derives scaling.
X1	SCANT	user	1 s	–	**SCAN T**ime interval for input: see Introduction, section ”Allowed SCANT values”.	–
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
52	ERR_CTRL	user	0	B	**ERR**or **C**on**TR**o**L**. 0=Value is frozen when error occurs. 1=Value is set to the value of ERR_VAL when error occurs.	–
59(3).109	ERR_VAL	user	0.0	–	**ERR**or **VAL**ue. Value to be set when error occurs and ERR_CTRL=1.	–
19	VALUE	system	–	R(r/w)	Process **VALUE** in engineering unit.	–
22	ERR	system	–	B(r/w)	1=Hardware or configuration **ERR**or or signal overflow.	–
23	UPDATED	system	–	B(r/w)	1=system indicates that the value has been **UPDATED**.	Cannot be affected by user.

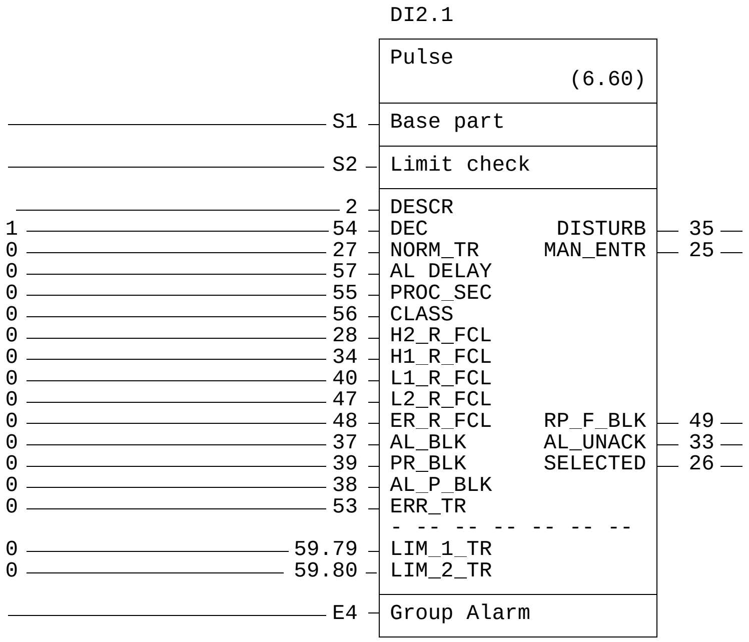
Limit check



Terminal Description, Limit check

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
59.74	EN_H2	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **2**.	–
59.70	HI_LIM2	user	90.0	R(r/w)	**HI**gh **LIM**it no. **2** in engineering unit.	Accepted value HI_LIM2 > HI_LIM1.
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **2**.	Cannot be affected by user.
59.75	EN_H1	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **1**.	–
59.71	HI_LIM1	user	80.0	R(r/w)	**HI**gh **LIM**it no. **1** in engineering unit.	Accepted value LO_LIM1 < HI_LIM1 < HI_LIM2.
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **1**.	Cannot be affected by user.
59.76	EN_L1	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **1**.	–
59.72	LO_LIM1	user	20.0	R(r/w)	**LO**wer **LIM**it no. **1** in engineering unit.	Accepted value HI_LIM1 > LO_LIM1 > LO_LIM2.
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **1**.	Cannot be affected by user.
59.77	EN_L2	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **2**.	–
59.73	LO_LIM2	user	10.0	R(r/w)	**LO**wer **LIM**it no. **2** in engineering unit.	Accepted value LO_LIM2 < LO_LIM1.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **2**.	Cannot be affected by user.
59.78	HYST	user	1.0	R(r/w)	**HYST**eresis for limit check in engineering units.	The hysteresis is located within each limit.

Operator functions



Terminal Description, Operator functions

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters
54	DEC	user	1	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
27	NORM_TR	user	0	B(r/w)	1=**NORM**al event handling in Operator Station.	0=no event handing.
57	AL_DELAY	user, PC	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
55	PROC_SEC	user	0	–	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.

Terminal Description, Operator functions (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
56	CLASS	user	0	–	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2 R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1 R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1 R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **2 R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
48	ER_R_FCL	user	0	B(r)	**ER**ror **R**epeat **F**ail **C**ontro**L**. Reduced number of repeating error alarms.	–
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–
38	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program.	–
53	ERR_TR	user	0	–	**ERR**or **TR**eatment. Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of signal errors.	Recommended settings 0=No event reporting 2=Event reporting incl. alarm handling
59.79	LIM_1_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and **L1 LIM**it **TR**ansgressions.	Recommended settings 0=No event handling 3=Event handling, no alarm handling 4=Event handling, incl. alarm handling
59.80	LIM_2_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L**2 LIM**it **TR**ansgressions.	Recommended settings 0=No event handling 3=Event handling, no alarm handling 4=Event handling, incl. alarm handling

Terminal Description, Operator functions (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

2.6 Calculated Analog Input, AIC

Calculated measured values sometimes have to be treated in the same way as those measured values coming directly from a process transmitter. It means presentation, event handling, alarm handling, dialog possibilities etc. The calculated value from the PC-program is connected to a variant of the functional unit Analog Input designated AIC. Some applications are indicated in Section 2.9 Application Examples. No hardware is included in the functional unit AIC.

2.6.1 Function

AI Calculated AIC

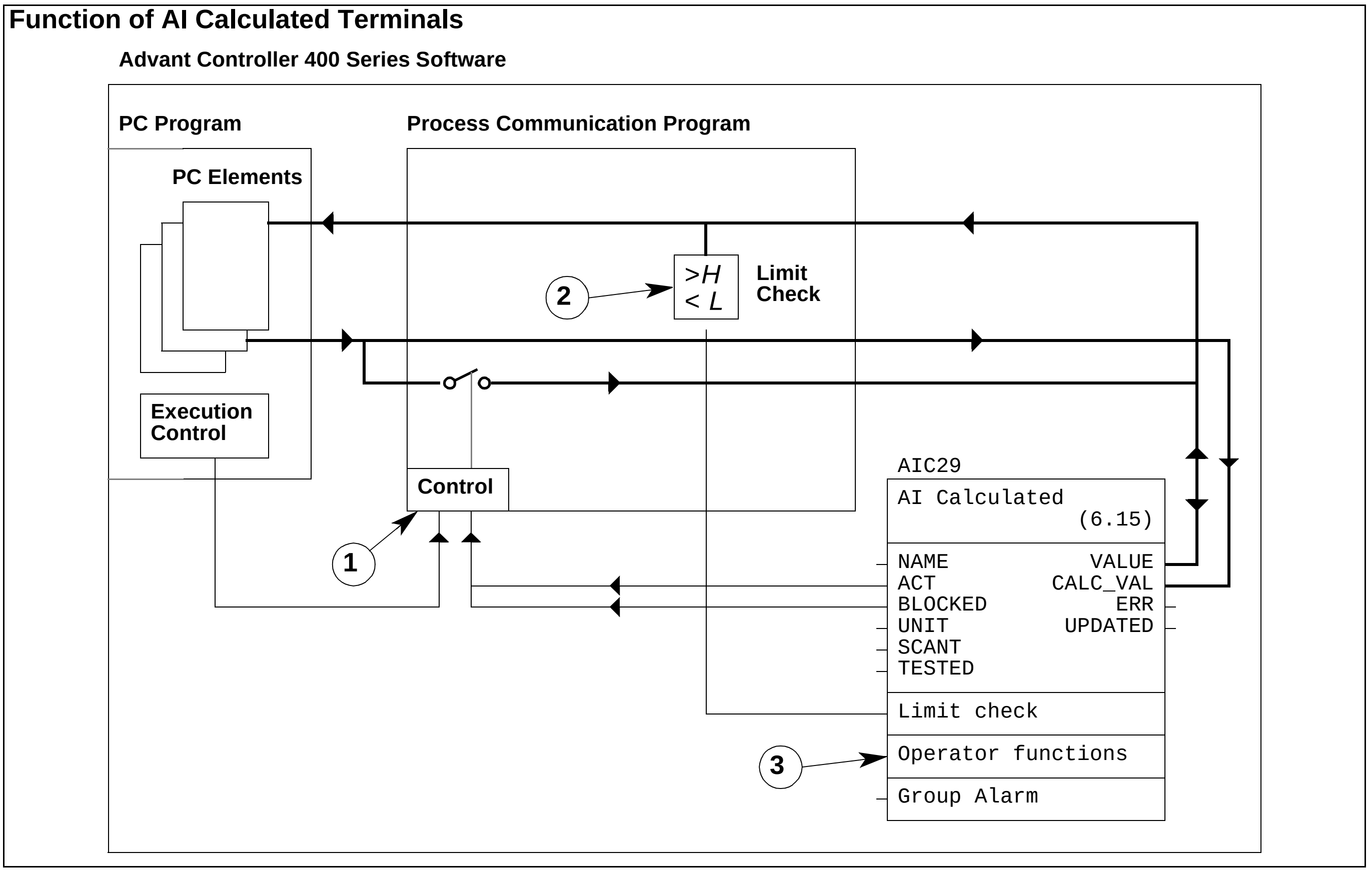
Function

The AI Calculated data base element defines an internal analog input so that the process communication program can treat calculated signals as if they came from the process. For example, the PC program may calculate the difference or average of two analog input signals and present it in an AI Calculated element. To the Advant Station 500 Series Operator Station system it will look as if it was a true input.

The signal processing controlled by the element includes:

1. Updating
2. Limit check
3. Operator Station functions

The figure below illustrates this signal handling.



1. **Updating**

PC programs and commands writes to the terminal CALC_VAL. If BLOCKED=0 full signal treatment is done including updating of VALUE.

If you set BLOCKED, the data acquisition stops, allowing manual entry of VALUE.

To disable the data acquisition completely, you set ACT=0. This excludes the element from signal processing.

2. **Limit check**

In the limit check part of the element you determine if and how limit checking will be performed. The result is presented in the output terminals and is thus available to PC and other programs. If the NORM_TReat flag is set to 1, each change in limit check status is also sent to the Advant Station 500 Series Operator Station . The main use of this function is for Advant Station 500 Series Operator Station presentation but it is also a convenient alternative to limit checking with PC element COMP_R.

3. **Operator Station functions**

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and Section 2.8 Operator Station Functions.

2.6.2 Data Base Element

2.6.2.1 AIC channel

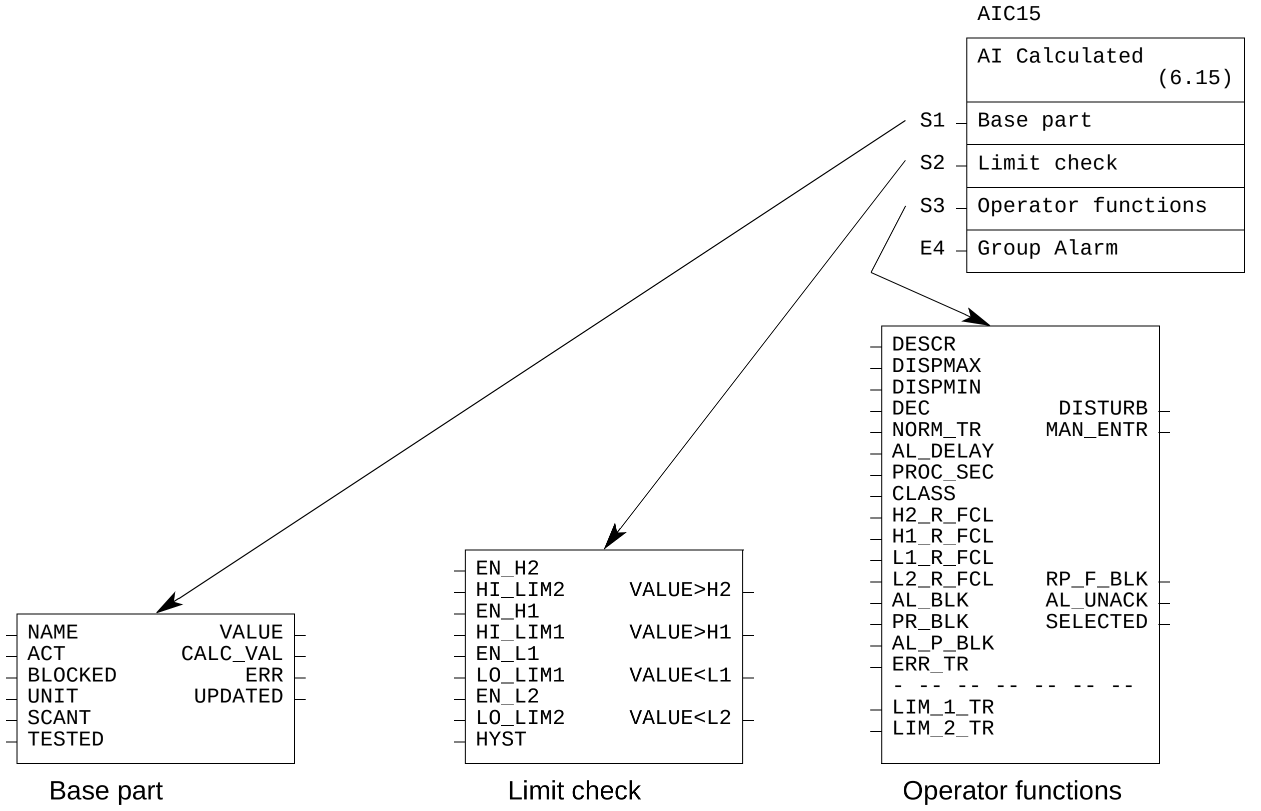
AI Calculated AIC

Summary

The data values of the Al Calculated data base element defines an internal analog input signal so that the process communication program can treat your calculated signals as if they came from the process. For information about the extension parts of Group Alarm see data base element Group Member.

The main purpose is to supply an interface to Operator functions for signals that do not correspond to physical signals, but have been calculated by the system, usually by PC programs.

Overview



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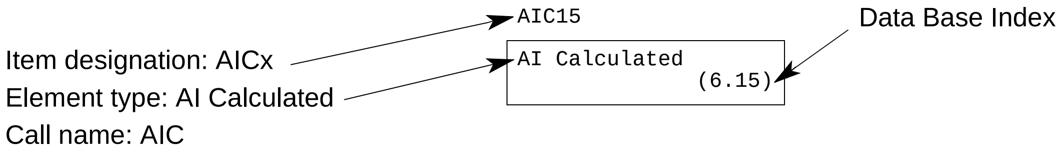
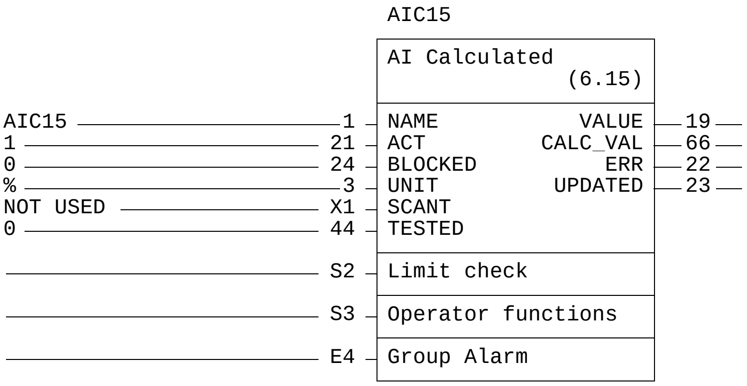


Base part



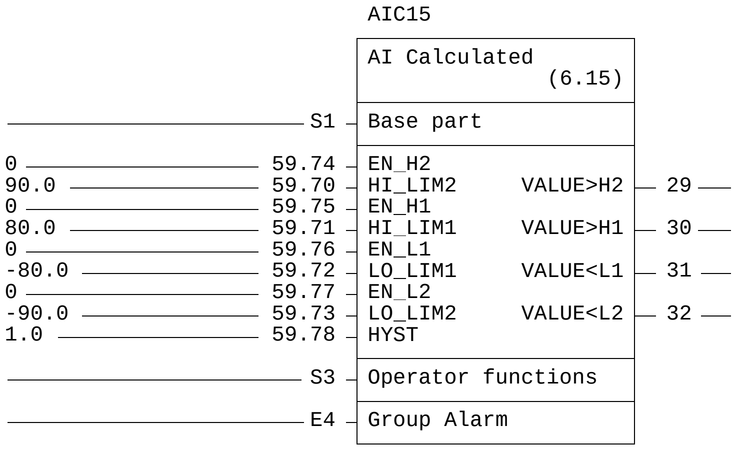
Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	AICx	–	Each AI Calculated signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive. 0=the signal is spare.	–
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
3	UNIT	user	%	–	The engineering **UNIT** relating to the signal value stored.	Maximum 6 characters.
X1	SCANT	user	NOT USED	–	Not used. PC-program connected to CALC_VAL determines **SCANT**ime	–
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
19	VALUE	system	–	R(r/w)	Signal **VALUE** in engineering unit.	–
66	CALC_VAL	system	–	R(r/w)	Input connection for the **CALC**ulated **VAL**ue.	Normally connected to PC program.

Terminal Description, Base part (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
22	ERR	system	–	B(r/w)	1=Configuration **ERR**or.	Can only be reset by correcting the error.
23	UPDATED	system	–	B(r/w)	1=Value has been **UPDATED** since start-up.	Cannot be affected by user.

Limit check



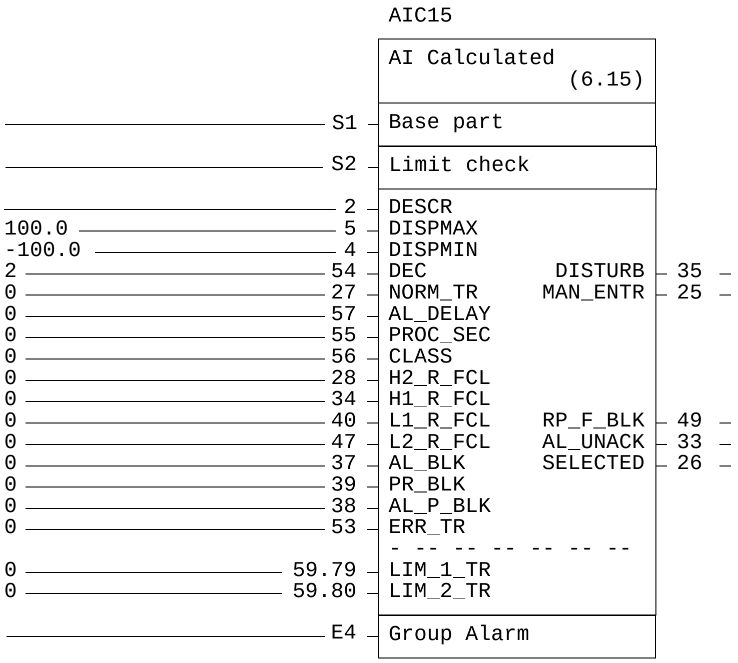
Terminal Description, Limit check

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
59.74	EN_H2	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **2**.	–
59.70	HI_LIM2	user	90.0	R(r/w)	**HI**gh **LIM**it no. **2** in engineering unit.	Accepted value HI_LIM2 > HI_LIM1.
59.75	EN_H1	user	0	B(r/w)	1=**EN**ables **H**igh limit no. **1**.	–
59.71	HI_LIM1	user	80.0	R(r/w)	**HI**gh **LIM**it no. **1** in engineering unit.	Accepted value LO_LIM1 < HI_LIM1 < HI_LIM2.
59.76	EN_L1	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **1**.	–
59.72	LO_LIM1	user	–80.0	R(r/w)	**LO**wer **LIM**it no. **1** in engineering unit.	Accepted value HI_LIM1 > LO_LIM1 > LO_LIM2.

Terminal Description, Limit check (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
59.77	EN_L2	user	0	B(r/w)	1=**EN**ables **L**ow limit no. **2**.	–
59.73	LO_LIM2	user	–90.0	R(r/w)	**LO**wer **LIM**it no. **2** in engineering unit.	Accepted value LO_LIM2 < LO_LIM1.
59.78	HYST	user	1.0	R(r/w)	**HYST**eresis for limit check in engineering units.	The hysteresis is located within each limit.
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **2**.	Cannot be affected by user.
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit no. **1**.	Cannot be affected by user.
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **1**.	Cannot be affected by user.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit no. **2**.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Terminal No	**Terminal Name**	**Value entered by**	**Default value**	**PC connection data type**	**Description**	**Remarks**
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
5	DISPMAX	user	100.0	R(r/w)	**MAX**imum value **DISP**layed on screen	Derives scaling for graphic presentation.
4	DISPMIN	user	–100.0	R(r/w)	**MIN**imum value **DISP**layed on screen.	Derives scaling for graphic presentation.
54	DEC	user	2	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
27	NORM_TR	user	0	B(r)	1=**NORM**al event handling in Operator Station.	0=no event driven updating in Operator Station.
57	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
55	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
56	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–

Terminal Description, Operator functions (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–
38	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program.	–
53	ERR_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of signal **ERR**ors and operator commands.	Recommended settings 0=No event reporting 2=Event reporting including alarm handling
59. 79	LIM_1_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and L1 **LIM**it **TR**ansgressions.	Recommended settings 0=No event handling 3=Event handling, no alarm handling 4=Event handling, incl. alarm handling
59. 80	LIM_2_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L2 **LIM**it **TR**ansgressions.	Recommended settings 0=No event handling 3=Event handling, no alarm handling 4=Event handling, incl. alarm handling
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

2.7 Analog Input Event, AIEV

The main function of Analog Input Event (AIEV) is to provide for receival of time tagged events from externally connected controllers, e.g. Advant Controller 110. Receiving of events is configured by means of Event Set (EVS). Analog events (AIEV) and Digital events (DIEV) can be mixed in the same Event Set.

2.7.1 Function

AI Event AIEV

Function

The purpose of the AI Event data base element is to provide for receival of time tagged events generated by an AI object in an external Controller (e.g. Advant Controller 110). The Operator functions treats the AIEV signal as an ordinary input signal.

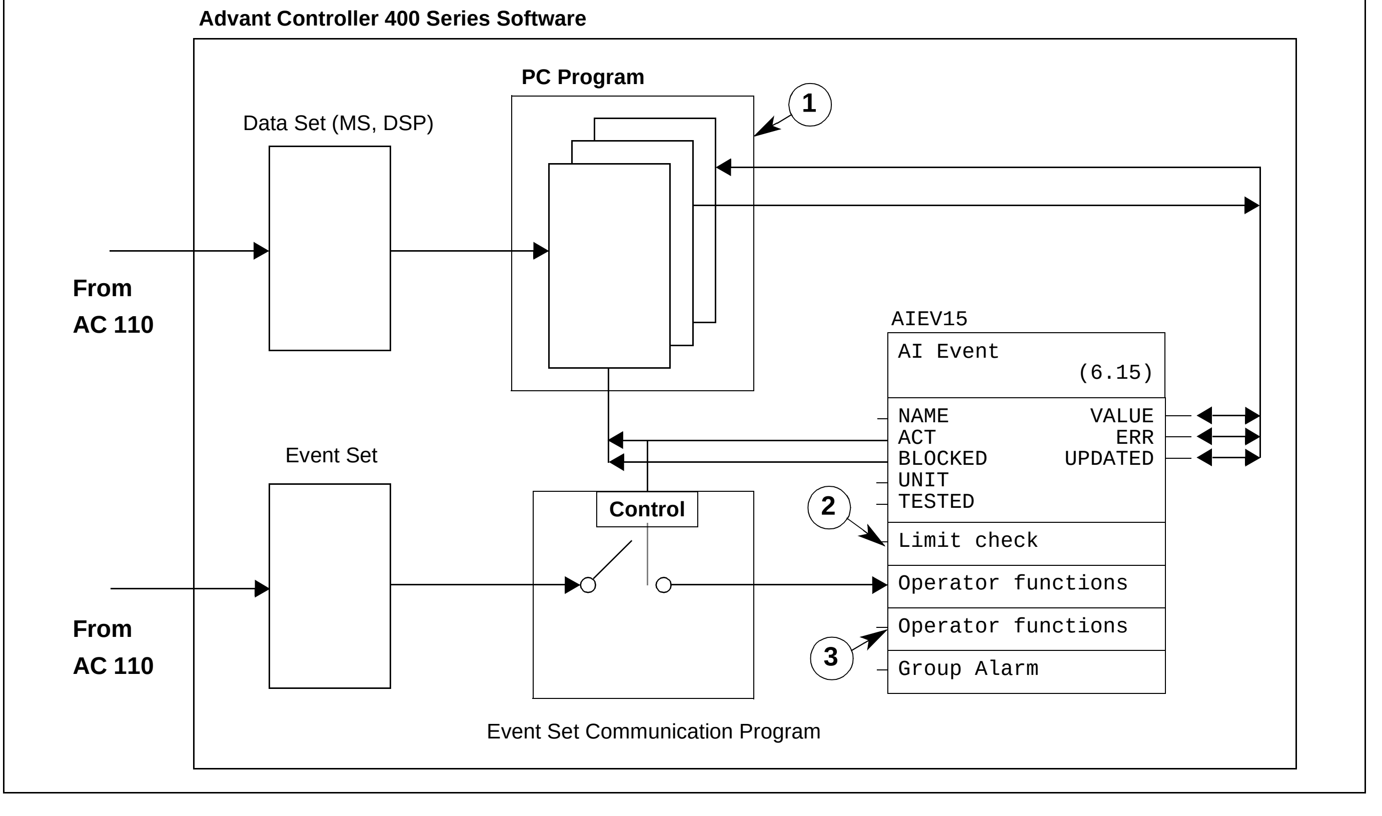
The following signal processing is **NOT** performed by the AI Event data base element:

1. Updating
2. Limit Checking

Signal processing performed by the element is:

3. Event handling

Function of AIEV Terminals



1. Updating

The VALUE terminal is not updated by the system when receiving external events. It is however possible to make the AI Event behave more or less as a complete AI object with some application programming. The application must use the Data Set Peripheral communication to cyclically receive the value from the corresponding AI Calculated element in the Advant Controller 110, and then update the VALUE terminal of the AI Event data base element.

Terminals to be handled by an application program when making AI Event a more complete AI object.

The VALUE terminal is included but are not handled by the system. It provide for a possible update by the application program, by means of cyclic Data Set transfer and a PC application update. The update of the VALUE terminal does not generate an event to the Advant Station 500 Series Operator Station when any of the limits is crossed. The events are supposed to come from the external controller via the Event Set communication to which this element is supposed to be connected.

The UPDATED terminal is only reset to 0 at system start up and is after this not handled by the system. The application program is supposed to handle the update of this terminal when updating the VALUE terminal.

It is the application program responsibility to act according to what is specified on the BLOCKED terminal when updating the VALUE terminal. This is not taken care of by the system.

The ACT terminal controls the flow of time tagged events. It does not prevent the PC application program from updating the VALUE of the element, this must be controlled by the PC program itself.

The ERR terminal can be used by the PC application program to indicate erroneous values or other fatal errors.

2. Limit checking

No limit checking is performed by the system when VALUE is updated. All limit checking is assumed to be performed in the external controller (e.g. Advant Controller 110). The limit check terminals are only included for display purposes in the Advant Station 500 Series Operator Station.

The EN_H2, EN_H1, EN_L1 and EN_L2 terminals is set by default to enable external events for all limits. The limits is best configured according to the corresponding AIC element in the external controller. Note that if a limit is not enabled in the AI Event element and an external event is received for this limit, the event will not be handled by the Operator functions.

The HI_LIM2, HI_LIM1, LO_LIM1 and LO_LIM2 terminals can be configured to the same limit values as specified in the corresponding event generator, e.g. the AI Calculated element in Advant Controller 110. The limits are only used for display purposes in the Advant Station 500 Series Operator Station.

3. Event handling

As explained above is the events supposed to be generated by an external controller and received by object, if it is connected to the Event Set communication (see Event Set (Receive)). The event handling is an Operator function.

Note that all events are lost (not sent to the Operator Station) when the BLOCKED terminal is set to 1.

To disable the flow of time tagged events completely, you set ACT = 0. This excludes the element from event processing.

2.7.2 Data Base Element

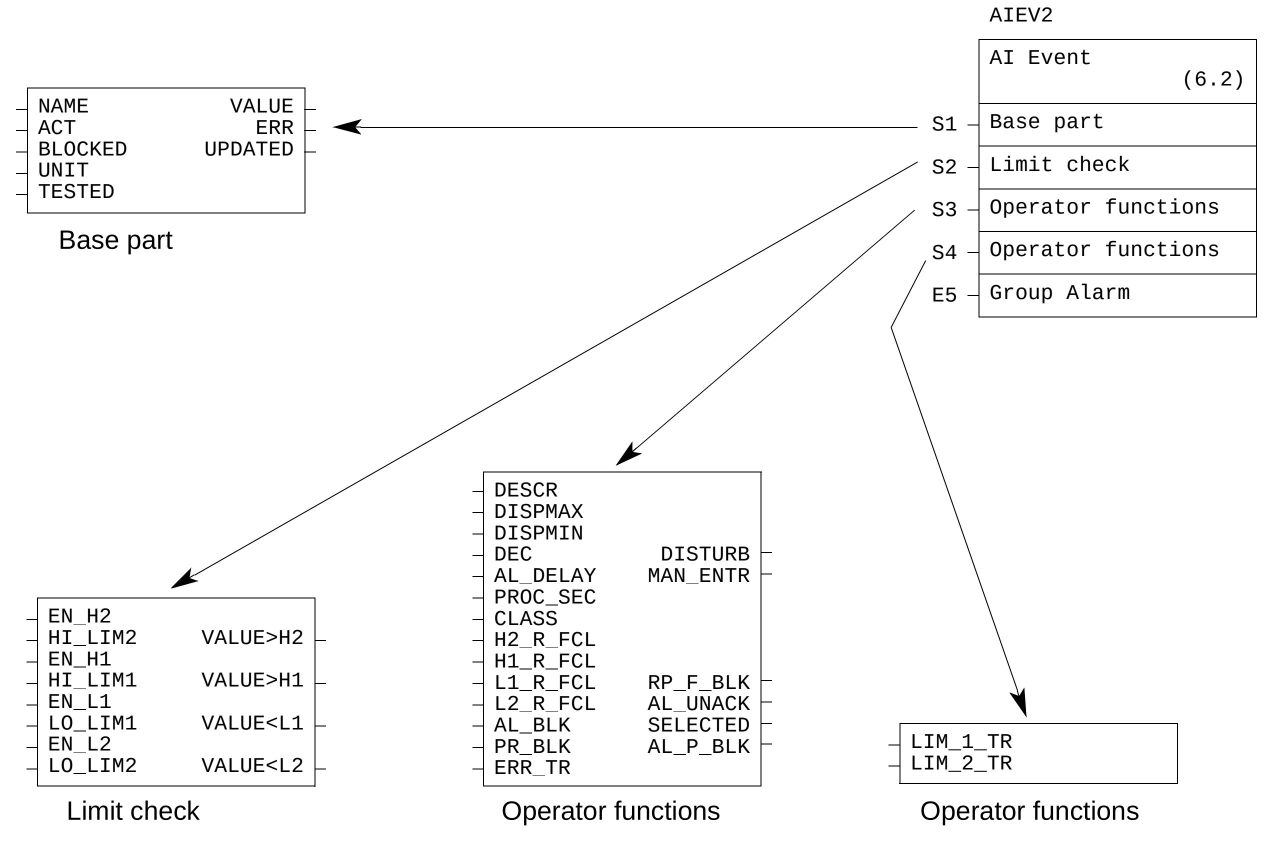
AI Event AIEV

Summary

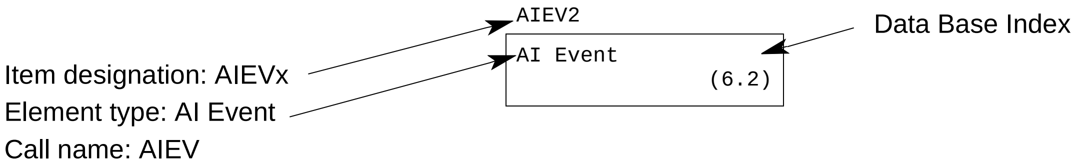
The AI Event data base element main function is to provide for receival of time tagged events from externally connected controllers, e.g. Advant Controller 110. The process value terminal is not updated by the event set handler. It means that the event and alarm handling is the primary function for the functional unit variant AIEV.

The AI Event can be treated as an ordinary analog input, if the PC application program is built to cyclically receive the externally measured or calculated value. Receiving of the value can be programmed by means of data set communication. Depending on selected communication type (RCOM or Advant Fieldbus 100) between the Advant Controller 400 Series and Advant Controller 110, can MS (MVI Data Set communication) or DSP (Data Set Peripheral) be selected for the data set transfer.

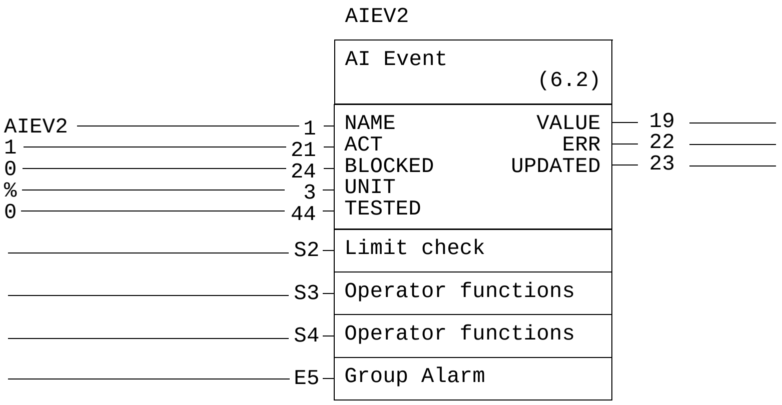
Overview



Head



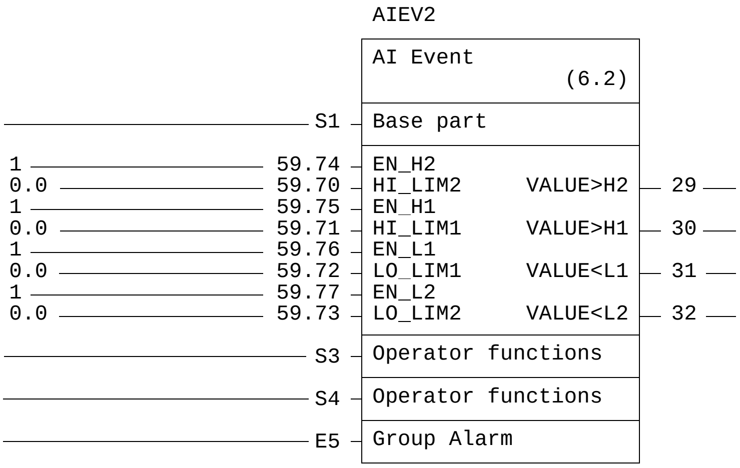
Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	AIEVx	–	Unique **NAME** of the AI Event signal.	Max. 20 characters.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive. 0=the signal is spare.	–
24	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
3	UNIT	user	%	–	The engineering **UNIT** relating to the signal value stored.	Maximum 6 characters.
44	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
19	VALUE	PC	0	R(r/w)	Signal **VALUE**.	–
22	ERR	system	0	B(r/w)	1=Configuration **ERR**or.	Can only be reset by correcting the error.
23	UPDATED	PC	0	B(r/w)	1=Value has been **UPDATED** since start-up.	Refer to section “Updating” for more information.

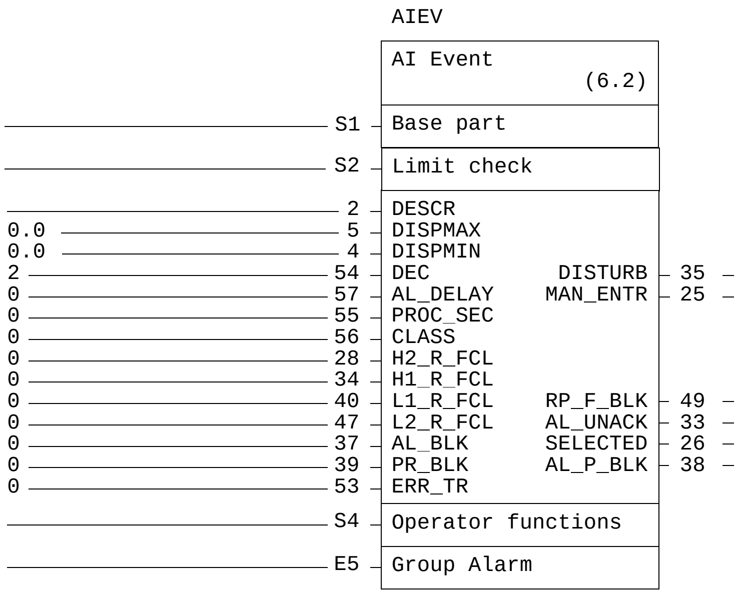
Limit check



Terminal Description, Limit check

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
59.74	EN_H2	user	1	B(r/w)	**EN**able **H**igh limit **2**.	–
59.70	HI_LIM2	user	0.0	R(r/w)	**HI**gh **LIM**it **2**.	–
59.75	EN_H1	user	1	B(r/w)	**EN**able **H**igh limit **1**.	–
59.71	HI_LIM1	user	0.0	R(r/w)	**HI**gh **LIM**it **1**.	–
59.76	EN_L1	user	1	B(r/w)	**EN**able **L**ow limit **1**.	–
59.72	LO_LIM1	user	0.0	R(r/w)	**LO**w **LIM**it **1**.	–
59.77	EN_L2	user	1	B(r/w)	1=**EN**ables **L**ow limit **2**.	–
59.73	LO_LIM2	user	0.0	R(r/w)	**LO**w **LIM**it **2**.	–
29	VALUE>H2	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit **2**.	Cannot be affected by user.
30	VALUE>H1	system	–	B(r/w)	1=**VALUE** has exceeded **H**igh limit **1**.	Cannot be affected by user.
31	VALUE<L1	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit **1**.	Cannot be affected by user.
32	VALUE<L2	system	–	B(r/w)	1=**VALUE** has fallen below **L**ow limit **2**.	Cannot be affected by user.

Operator functions (part 1)



Terminal Description, Operator functions (part 1)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
5	DISPMAX	user	0.0	R(r/w)	**MAX**imum value **DISP**layed.	–
4	DISPMIN	user	0.0	R(r/w)	**MIN**imum value **DISP**layed.	–
54	DEC	user	2	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
57	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	Not used.
55	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
56	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–

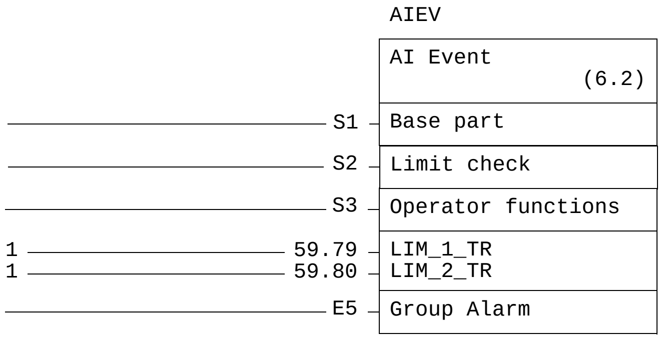
Terminal Description, Operator functions (part 1) (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
28	H2_R_FCL	user	0	B(r)	**H**igh limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H2 limit alarms.	–
34	H1_R_FCL	user	0	B(r)	**H**igh limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating H1 limit alarms.	–
40	L1_R_FCL	user	0	B(r)	**L**ow limit **1** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L1 limit alarms.	–
47	L2_R_FCL	user	0	B(r)	**L**ow limit **2** **R**epeat **F**ail **C**ontro**L**. Reduced number of reports in Operator Station of repeating L2 limit alarms.	–
37	AL_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
39	PR_BLK	dialog	0	B(r/w)	Flag for **BL**oc**K**ing of **PR**intout in Operator Station.	–
53	ERR_TR	user	0	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of signal **ERR**ors and operator commands.	Recommended settings 0=No event reporting 2=Event reporting including alarm handling
35	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indication whether a state of alarm exists in the element.	Cannot be affected by user.
25	MAN_ENTR	system	–	B(r/w)	1=Flag indication that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
49	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**ail **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
33	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–
26	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

Terminal Description, Operator functions (part 1) **(Continued)**

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
38	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC-program.	–

Operator functions (part 2)



Terminal Description, Operator functions (part 2)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
59.79	LIM_1_TR	user	1	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H1 and L1 **LIM**it **TR**ansgressions.	Recommended settings 1=Event handling, no alarm handling 2=Event handling, incl. alarm handling
59.80	LIM_2_TR	user	1	–	Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of H2 and L2 **LIM**it **TR**ansgressions.	Recommended settings 1=Event handling, no alarm handling 2=Event handling, incl. alarm handling

2.8 Operator Station Functions

The operator station function is divided in principle into four parts:

- Presentation. Display elements, Time logged properties
- Dialog
- Event handling
- Group Alarm

2.8.1 Presentation

Display elements which can be used for different display types are available for used in the functional unit Analog Input.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display.

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual*.

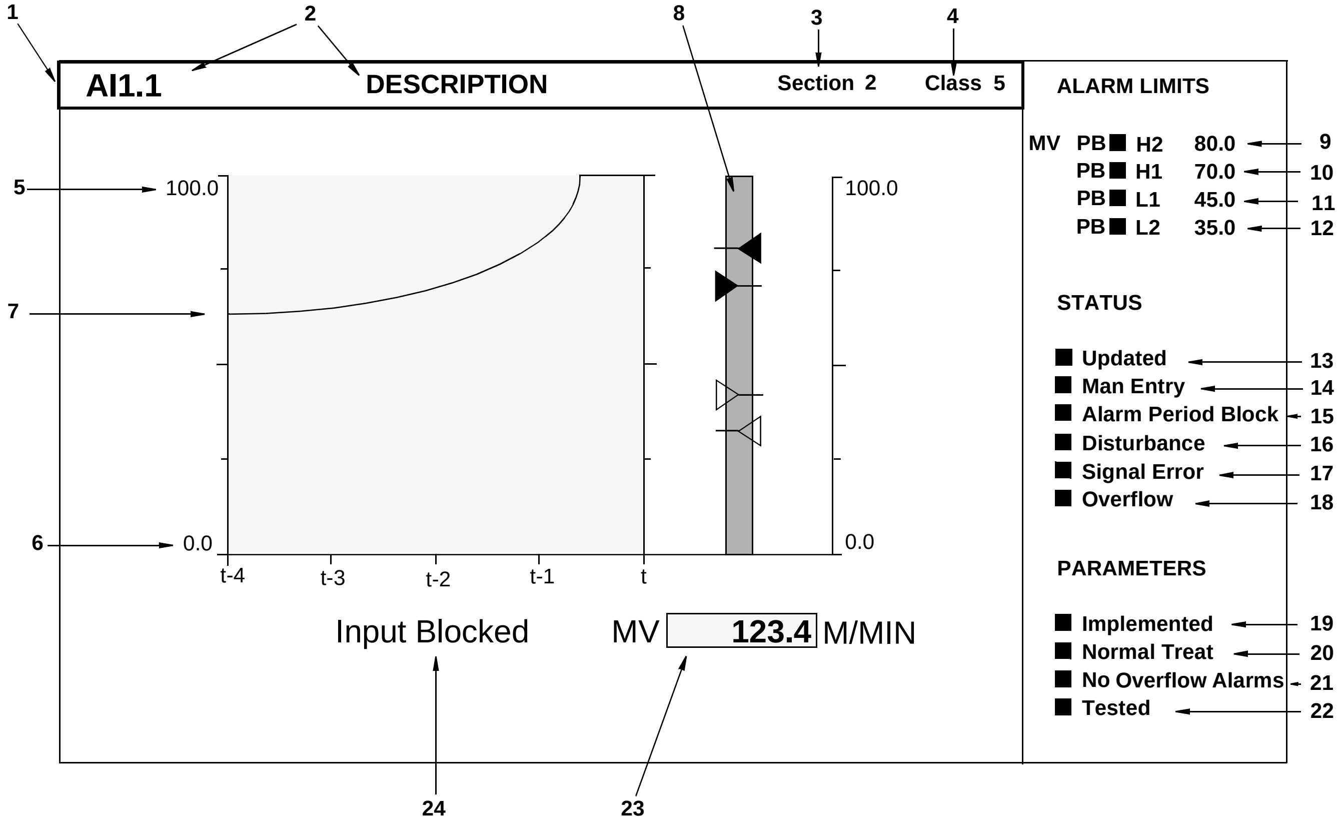
Detailed information of alternative way of presentation of certain status and data within the displays such as color, flashing, blocked etc. is given in the referenced manual.

Time-logged Properties

Measured values stored can be presented graphically in the form of curves on the display screen. Such a display, a **trend display**, can consist of 1-4 curves.

For the functional unit Analog Input the measured value can be logged and presented. The logged property is designated MV.

Object display: AIOB01

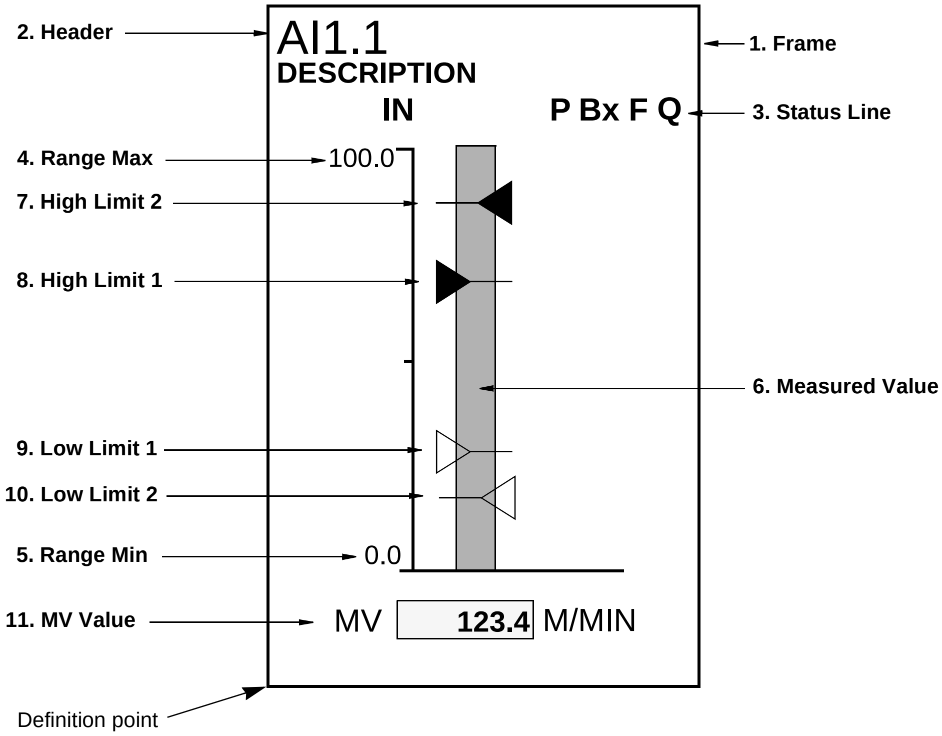


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3.1	Section Text	
3.2	Section Value	Process section
4.1	Class Text	
4.2	Class Value	Object class
5	Range Max	Range Max of the MV value
6	Range Min	Range Min of the MV value
7	Measured Value Trim Curve	Object value - Trim curve
8.1	Measured Value Bargraph	
8.2	High Limit 2	Alarm High limit 2
8.3	High Limit 1	Warning High limit 1
8.4	Low Limit 1	Warning Low limit 1
8.5	Low Limit 2	Alarm Low limit 2

No	Description	Remarks
9	ALARM LIMITS FOR MV	
9.1	Printout blocked	
9.2	Alarm blocked	
9.3	Alarm Indication	Alarm High limit 2
9.4	H2 Text	
9.5	H2 Value	High limit 2 value
10.1	Printout blocked	
10.2	Alarm blocked	
10.3	Alarm Indication	Alarm High limit 1
10.4	H1 Text	
10.5	H1 Value	High limit 1 value
11.1	Printout blocked	
11.2	Alarm blocked	
11.3	Alarm Indication	Alarm Low limit 1

No	Description	Remarks
11.4	L1 Text	
11.5	L1 Value	Low limit 1 value
12.1	Printout blocked	
12.2	Alarm blocked	
12.3	Alarm Indication	Alarm Low limit 2
12.4	L2 Text	
12.5	L2 Value	Low limit 2 value
13	STATUS	
13.1	Updated Indication	
13.2	Updated text	
14.1	Manual entry Indication	
14.2	Manual entry text	
15.1	Alarm period block Indication	
15.2	Alarm period block text	
16.1	Disturbance Indication	Fault
16.2	Disturbance text	
17.1	Signal error Indication	I/O Error
17.2	Signal error text	
18.1	Overflow Indication	
18.2	Overflow text	
19	PARAMETERS	
19.1	Implemented Indication	
19.2	Implemented text	
20.1	Normal treat Indication	Normal object treat
20.2	Normal treat text	
21.1	No overflow Indication	No error at overflow
21.2	No overflow text	
22.1	Tested Indication	
22.2	Tested text	
23.1	MV Text	
23.2	MV Value	Measured value
23.3	MV Unit	
24	Input Blocked	

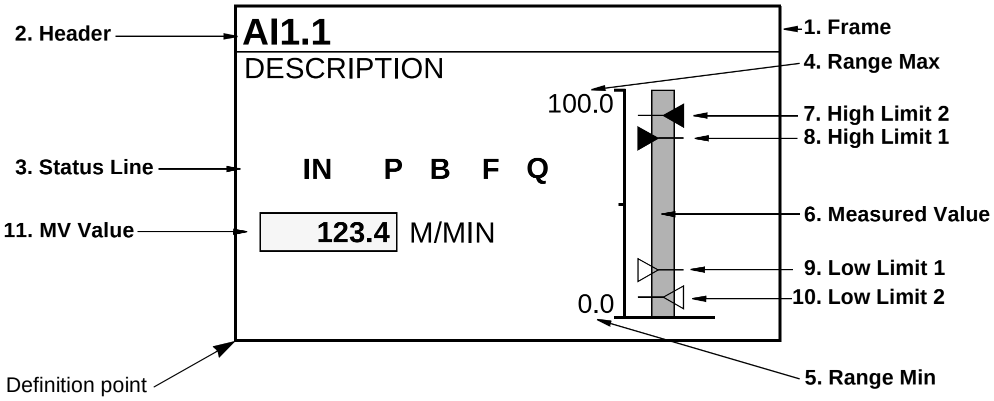
Display Element for Group display: AIGR01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Input blocked	
3.2	Printout blocked	
3.3	Alarm blocked	
3.4	Alarm Indication	
3.5	Error Indication	I/O Error
4	Range Max	Range Max of the MV value
5	Range Min	Range Min of the MV value

No	Description	Remarks
6	Measured Value	
6.1	MV	
6.2	MV Value	
6.3	MV Unit	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2
11	Measured Value Bargraph	

Display Element for Object closeup display: AIOWI01

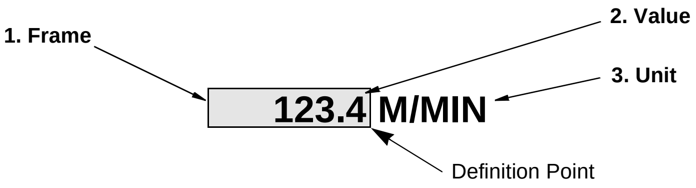


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Input blocked	
3.2	Printout blocked	
3.3	Alarm blocked	
3.4	Alarm Indication	
3.5	Error Indication	I/O Error
4	Range Max	Range Max of the MV value
5	Range Min	Range Min of the MV value

No	Description	Remarks
6	Measured Value Bargraph	
7	High Limit 2	Alarm High limit 2
8	High Limit 1	Warning High limit 1
9	Low Limit 1	Warning Low limit 1
10	Low Limit 2	Alarm Low limit 2
11	Measured Value	
11.1	MV	
11.2	MV Value	
11.3	MV Unit	

Display Element for Process display:

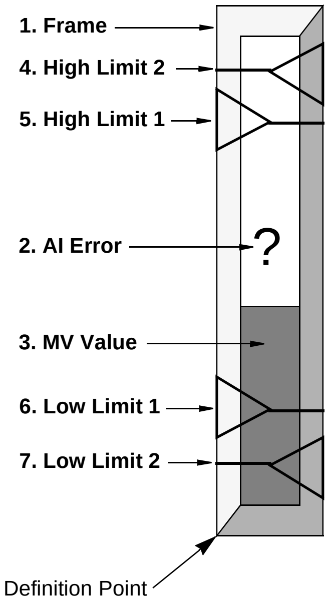
AIPD01



No	Description	Remarks
1	SelectFrame	
2	Measured Value	

No	Description	Remarks
3	Unit	

AIPD51



No	Description	Remarks
1.1	SelectFrame	
1.2	TopLeftEdge	Three Dimensions effect
1.3	BottomRightEdge	Three Dimensions effect
2	AI Error	
3	MV Value	

No	Description	Remarks
4	High Limit 2	Alarm High limit 2
5	High Limit 1	Warning High limit 1
6	Low Limit 1	Warning Low limit 1
7	Low Limit 2	Alarm Low limit 2

2.8.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.

The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit Analog Input has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog but no subdialogs. The MAX dialog consists of an output dialog with 2 subdialogs.

MIN dialog (No authority key)

Keyboard keys

✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display

Dynamic keys, Keyboard

D1	D2	D3	D4	D5
D6	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display
Dialog	**Previous Level**	Select Top Level dynamic keys
Dialog	**Next Block**	Page between the dynamic key sets (Keyboard and Limits)

Dynamic keys, Top Level

D1 Block Input	D2 Block Alarm	D3 Block Printout	D4	D5 *Limits...*
D6 Deblock Input	D7 Deblock Alarm	D8 Deblock Printout	D9	D10 *Keyboard...*

Block Input	Block data base input
Block Alarm	Block alarm indication and event handling from signal
Block Printout	Block event printout from signal
Limits...	Select Dynamic keys: Limits
Deblock Input	Deblock data base input
Deblock Alarm	Deblock alarm indication and event handling from signal
Deblock Printout	Deblock event printout from signal
Keyboard...	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard...

D1	D2	D3	D4	D5
D6	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

Dynamic keys, Limits...

D1 H1 70.00	D2 H2 80.00	D3	D4	D5
D6 L1 45.00	D7 L2 35.00	D8	D9 Alarm Delay	D10

H1	Check/change alarm limit H1
H2	Check/change alarm limit H2
L1	Check/change alarm limit L1
L2	Check/change alarm limit L2
Alarm Delay	Time to delay alarms

2.8.3 Event Handling

This section contains a description of all alarms and events in the functional unit Analog Input. The description is given under the following headings:

- General
- Event description with standard texts
- Event and alarm blocking.

Event handling as a common property of the Advant OCS system is described in detail in Advant Station 500 Series Operation Station documentation and AdvaCommand documen–tation. Reference is made for example to *AdvaCommand Basic Functions User’s Guide* when there are special requirements of user defined event handling incl. texts.

The event texts for all functional units are also collected in the manual *AdvaCommand User Interface Reference Manual*, giving the user a convenient quick reference library for the application work.

General

The event handling is controlled by some configuration parameters, EVENT-TREAT pointers, in the data base element located in Advant Controller 400 Series and by utilizing a standard or a user defined Event Treat data base element in Advant Station 500 Series Operator Station. The principle is illustrated in the figure below.

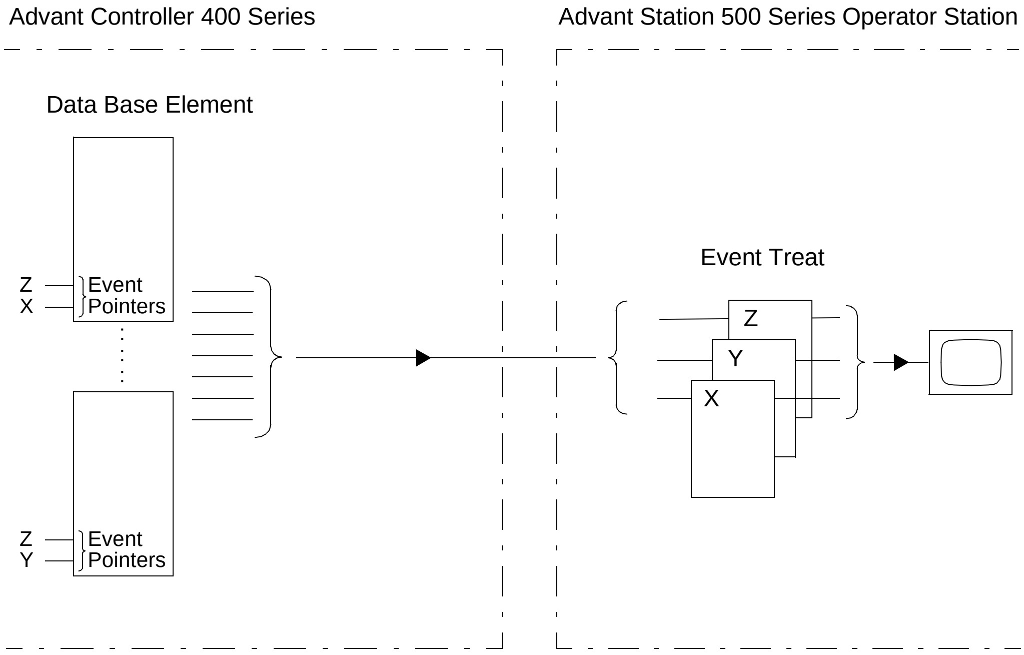

Advant Controller 400 Series
Advant Station 500 Series Operator Station
Data Base Element
Z
X
Event Pointers
Z
Y
Event Pointers
Event Treat
Z
Y
X

Figure 2-4. The principle of event handling in Analog Input

The Event Treat defines the event handling in the operator station such as audible alarms, text combinations in event and alarm list, colors, different handling for 0 -->1 and 1 -->0 transitions.

How different events from AI is treated is given in Table 2-1 below. This also specifies which event handling is obtained as default and which alternative standard functions are available.

Event description with standard texts

Table 2-1. Event Texts for AI

Events	Event Treat pointer	Property text		Event text	
		Standard text	Line No in Event Treat	Standard text	Line No in Event Treat
Upper limit H2 exceeded	LIM_2_TR	Limit H2	1	Alarm	1
Upper limit H2 re-entered	LIM_2_TR	Limit H2	1	Normal	3
Upper limit H1 exceeded	LIM_1_TR	Limit H1	1	Alarm	1
Upper limit H1 re-entered	LIM_1_TR	Limit H1	1	Normal	3
Lower limit L1 exceeded	LIM_1_TR	Limit L1	2	Alarm	2
Lower limit L1 re-entered	LIM_1_TR	Limit L1	2	Normal	4
Lower limit L2 exceeded	LIM_2_TR	Limit L2	2	Alarm	2
Lower limit L2 re-entered	LIM_2_TR	Limit L2	2	Normal	4
Signal error On	ERR_TR	Sig.Err	1	Alarm	1
Signal error Off	ERR_TR	Sig.Err	1	Normal	2

Event and Alarm Blocking

The event and alarm blocking is discussed in a general way in the manual *Functional Units Part 1 Common Properties*.

A schematic description of the blocking facilities in the Analog Input is given in Appendix A .

In the dialog for the functional unit Analog Input, the operator can block and deblock the listed event- and alarm handling.

Table 2-2. Event and Alarm Blocking

Dialog Key	Event- and Alarm handling blocked for signals:	Remark
BLK AL	VALUE>H2, VALUE>H1, VALUE<L1, VALUE<L2, ERR	Block alarm
DEBLK AL	VALUE>H2, VALUE>H1, VALUE<L1, VALUE<L2, ERR	Deblock alarm
BLK PRT	VALUE>H2, VALUE>H1, VALUE<L1, VALUE<L2, ERR	Blocks printout on printers only
DEBLK PRT	VALUE>H2, VALUE>H1, VALUE<L1, VALUE<L2, ERR	Deblock printout

2.8.4 Group Alarm

It is possible to connect the functional unit AI to the group alarm function. This function makes it possible to gather alarm and events from related process signals and objects in to Alarm Groups. These groups are then treated as objects.

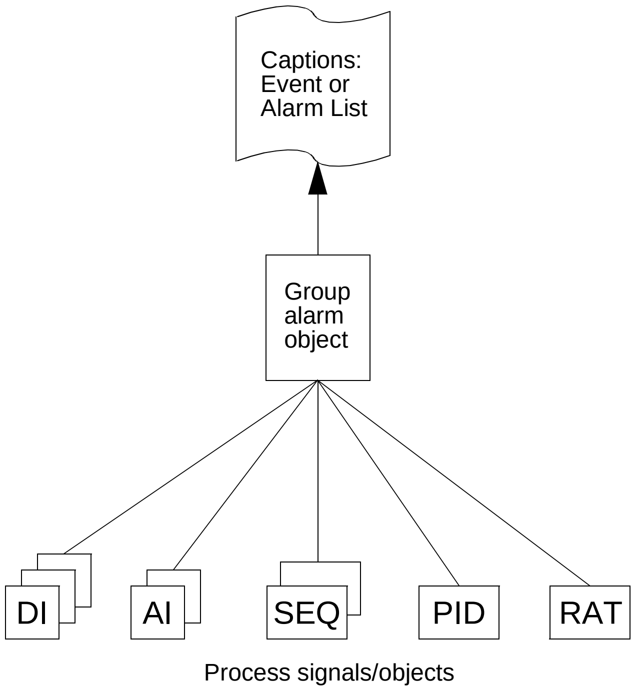


Figure 2-5. Group Alarm

The group alarm function consists of four parts as follows:

- Grouping of process alarms and events with a view to creating pilot alarms and events
- Blocking of groups
- Automatic acknowledgement
- External alarm outputs.

For a more detailed description of the group alarm function, reference is made to the manual *AdvaCommand Basic Functions User's Guide*.

2.9 Application Examples

A complete measurement circuit for, for example indication and possible logging, can be created with a single functional unit, Analog Input. Different additional functions can be selected through simple configuration-parameter setting in addition to a ground function which embraces presentation and dialog in the Advant Station 500 Series Operator Station. Some important standard functions for a measurement circuit in process control context is summarized in the following text. The ABB Master Programming Language, AMPL, is also available and with its great flexibility, offers possibilities of special application adaption.

Important Standard Functions

A range of circuit boards is available for the hardware adaption to different connection methods locally or distributed signal type, accuracy requirements, resolution requirements etc.

For measurement in industrial processes the hardware must enable or permit:

- 2-, 3-, 4-wire connection
- Flexible alternatives to transducer supply and fusing.
- Cross coupling possibilities for process wiring.
- Intrinsic safety
- Common mode rejection or galvanic isolation.
- Supervision of transducers, process wiring and control system function.
- Redundancy for increased safety.

Measurement signals can be unstable because of the measurement principle selected or the electrical inter-ference environment. The frequency content of the signal can often be unnecessarily great for the application concerned. It is important, in digital systems, to obtain interference-free control and logging, that the irrelevant frequency content in the process signals are limited. This means that the sampling frequency can be hold down without the risk of new frequencies being created through the so-called aliasing effect.

A low sampling frequency means that economical use is made of the CPU resources. The limitation of frequencies is performed through low- pass filtration in the hardware in two ways.

Standard signals for current and voltage are filtered in steep active filters whereas temperature measurement signals are filtered by integrating A/D conversion. In addition to hardware filtration, digital filtration with single pole filters and with the required break frequency can be selected by the software.

In the case of temperature measurement, linearization is performed in accordance with the type of Pt 100 transducer or thermocouple selected.

Linearization through root extraction e.g. with pressure difference measurement can be selected if required.

If possible, measurement signals with a live zero should be given preference.These give, in addition to the possibility of detecting faults in transducers and wiring, an increased possibility of detecting faults in the measurement channel electronics on the input board. With a live zero, integrated reference channels on boards and system supervision functions, it can be expected that almost 100 % of faults will be detected.

Special Linearization

Linearization in accordance with an optional function developed through for example experimental measurement is obtained by adding a PC element FUNG-1V.

Figure 2-6 shows the principle of this linearization. The curve required is described with a number of coordinates of which, up to 255 can be specified. Linear interpolation is performed between the coordinate values.

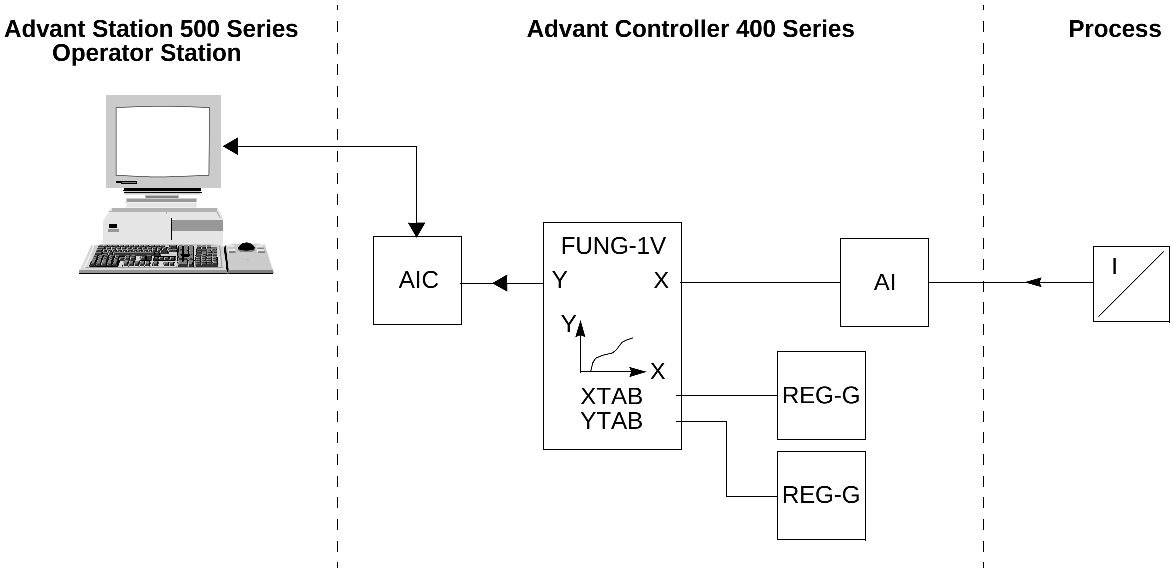


Figure 2-6. Linearization of measured values with function generator FUNG-1V

Calculated Process Measured Value

An optional calculation algorithm e.g. for normal flow or mass-flow calculation can be obtained in the PC program with arithmetical elements. The principle of this is shown in Figure 2-7.

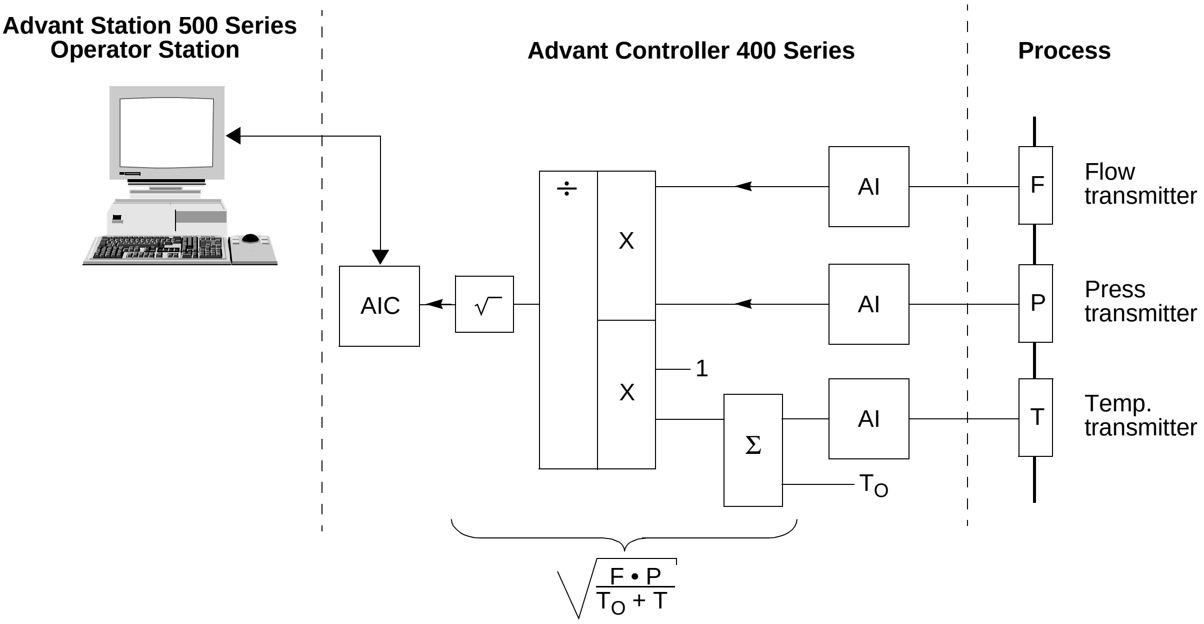


Figure 2-7. Measurement of normal flow

Limit Detection-Several Levels

The basic function in functional unit Analog Input enables the detection of 4 limits, 2 high levels and 2 low levels.

The number of levels can be increased as required by the addition of calculated analog inputs, AIC, or comparators COMP-R in the PC program. The later alternative is the most suitable as the passage of upper or lower limits should not cause an event and alarm in the Advant Station 500 Series Operator Station, but is only to be used in the PC program for, for example interlocking.

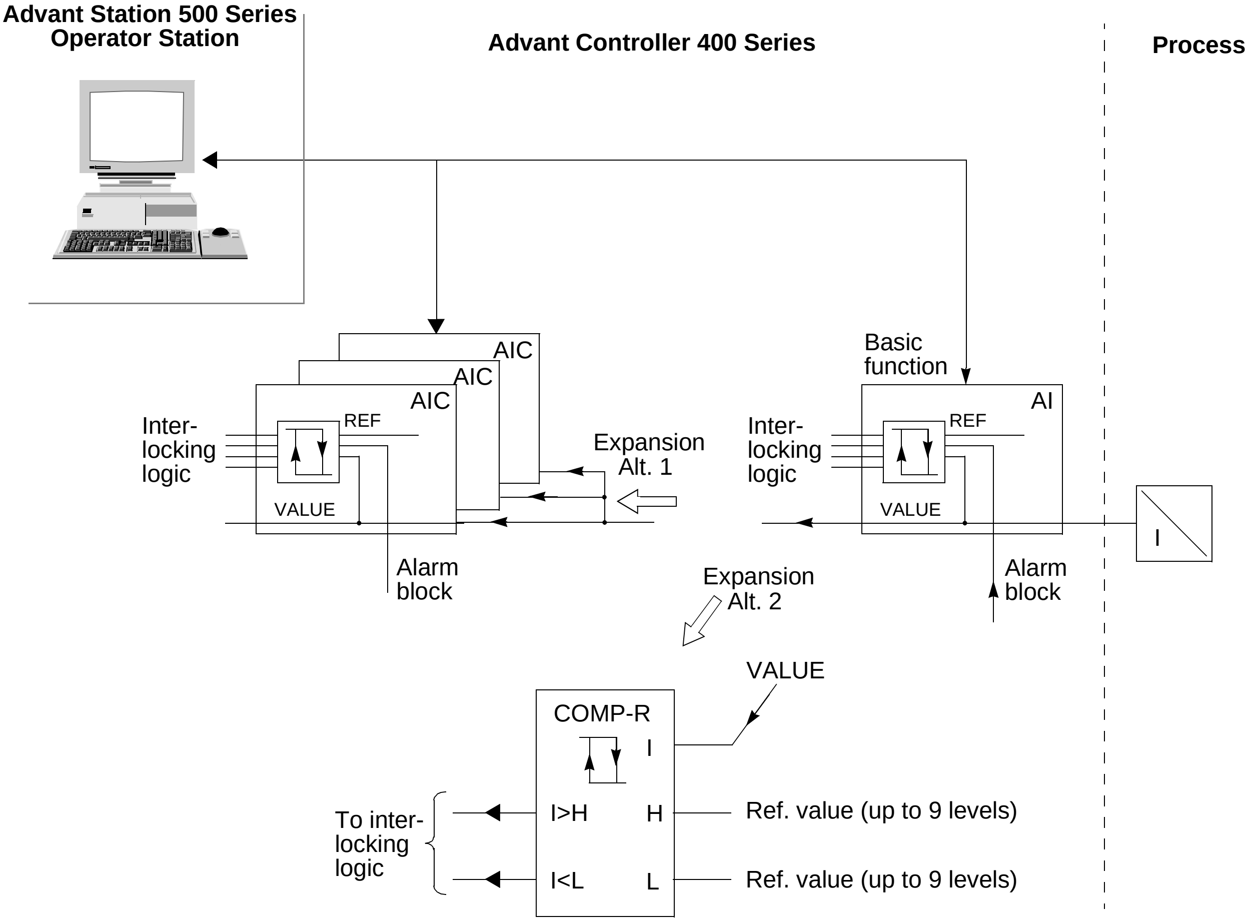


Figure 2-8. Limit detection-several levels

Flow Integration

Quantity measurement by means of time integration is performed in an application program in which the scaling required is determined. The principle of this is shown in the figure below.

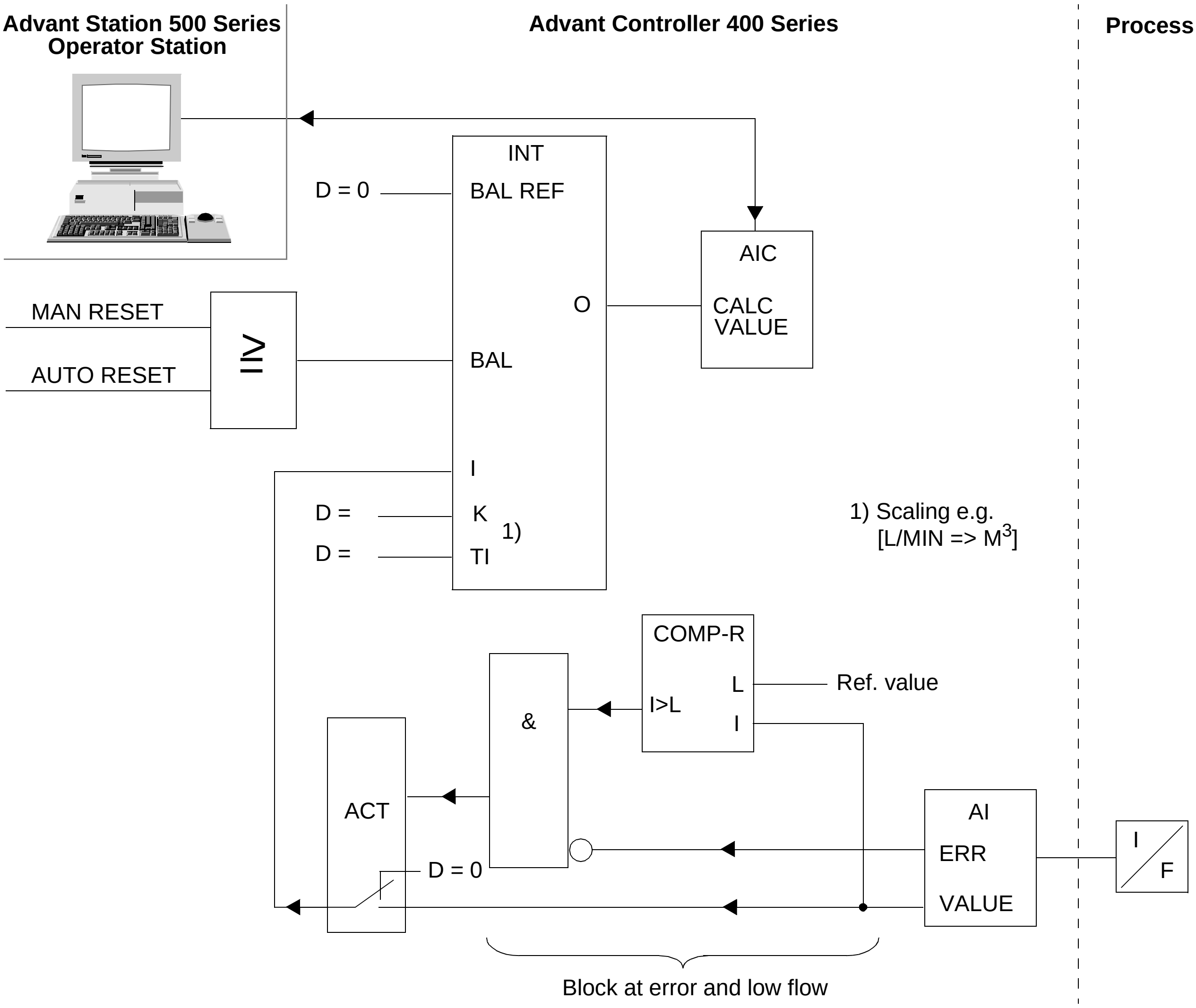

Advant Station 500 Series Operator Station
Advant Controller 400 Series
Process
INT
D = 0
BAL REF
AIC
O
CALC VALUE
MAN RESET
AUTO RESET
≥1
BAL
I
D =
K
1)
D =
TI
1) Scaling e.g. [L/MIN => M^3]
COMP-R
L
Ref. value
I>L
I
&
ACT
D = 0
AI
ERR
VALUE
I
F
Block at error and low flow

Figure 2-9. Flow integration

Two additional functions, simply implemented in the PC program, are to be named in this connection.

With small flow values in relation to the measurement range, the errors in measurement for certain measurement methods can be significant and automatic resetting of the measured value to zero can then be necessary. As an alternative two transducers with different measurement ranges can be used. The switch-over between measurement ranges is performed automatically with PC elements.

2.10 Function Diagram

The function diagram in section A.2 in Appendix A describes in detail the relation between all input and output signals in the functional units. Figure A-1 in Appendix A explains the used designations in the circuit diagram.

Chapter 3 Analog Outputs

The functional unit Analog Output is a part of the Advant OCS system. The unit incorporates functions for:

- Output signal storage and updating
- Auto and manual modes of control
- Limit checking prior to storage
- Scaling and output of an analog control signal to the process
- Operator station functions.

There are versions of analog outputs for:

- Current outputs with or without live signal zero
- Voltage outputs with or without live signal zero
- Redundant boards (combined analog inputs and outputs)
- Remote I/O units
- Internally calculated variables with no connection to hardware.

All these utilities make the unit a powerful tool for implementing process supervision and control. The existence of pre-configured functions, beyond the basic ones for data storage and output, means that the application engineering time, and cost, can be significantly reduced.

3.1 Configuration

3.1.1 General

The functional unit Analog Output consists of a number of hardware and software parts:

- A data base element for storage of the process output signal and various other descriptive properties and control parameters. A data base element may be seen as the outward representation of a data record. The purpose of it is to achieve convenient access to all relevant data at one place only.
- Operator station functions consisting of pre-configured presentation, dialog, event and alarm handling.

- A data base element for storage of parameters describing the output boardused and defining its function. The existence of a data base element for output board description facilitates easy change of board type and various parameters.
- An output channel of an analog output board.

All these parts relate to each other according to the Figure 3-1.

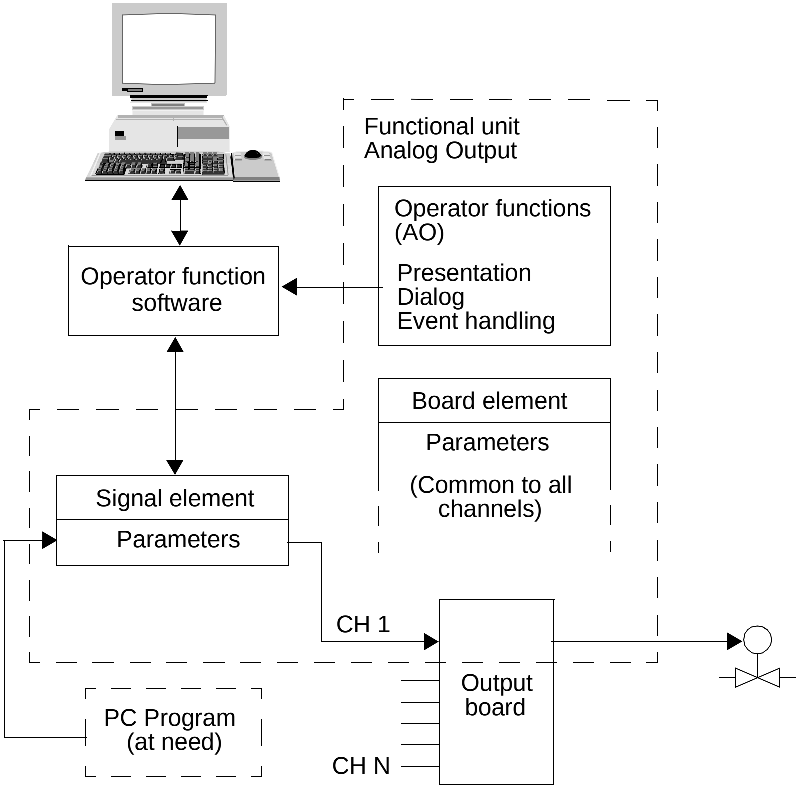


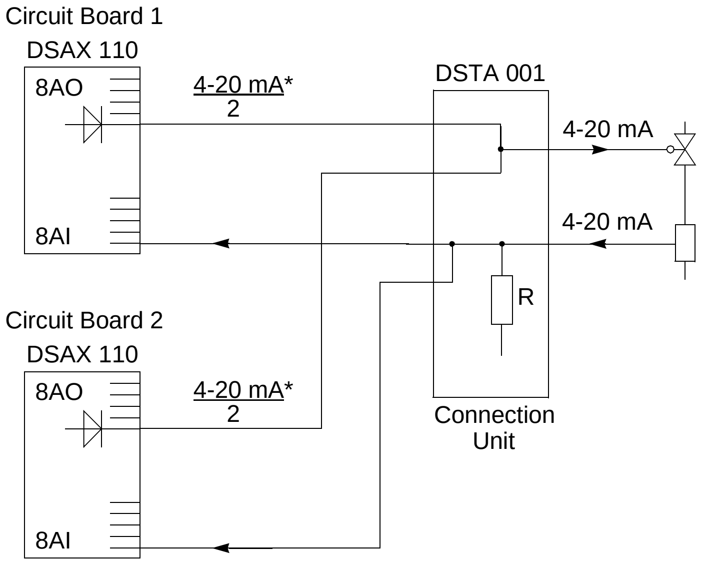
Figure 3-1. The structure of the functional unit Analog Output

3.1.2 Redundancy

The operational reliability and availability of critical control loops can be improved by redundant I/O-boards.

Functional units like Analog Input and Analog Output can make use of such specially developed boards. There are boards available including analog inputs only and boards including both inputs and outputs.

Redundancy is easily implemented by the ready made data base function and integrated diagnostics and status presentation. The Figure 3-2 illustrates the hardware implementation of redundancy for a 8 channels analog input-output board type DSAX 110.



* Normally: Load sharing
C.B. error: Faulty board 0 mA
Non faulty board 4-20 mA

Figure 3-2. Implementation of redundant loop I/O

The two circuit boards are functionally brought together in the software by a common board data base element AX Redundant.

The continued signal treatment in the software is then carried out in the normal way. Please observe that the combined AI, AO board DSAX_110 make reference to both Analog Input and Analog Output elements. This is illustrated in Figure 3-3.

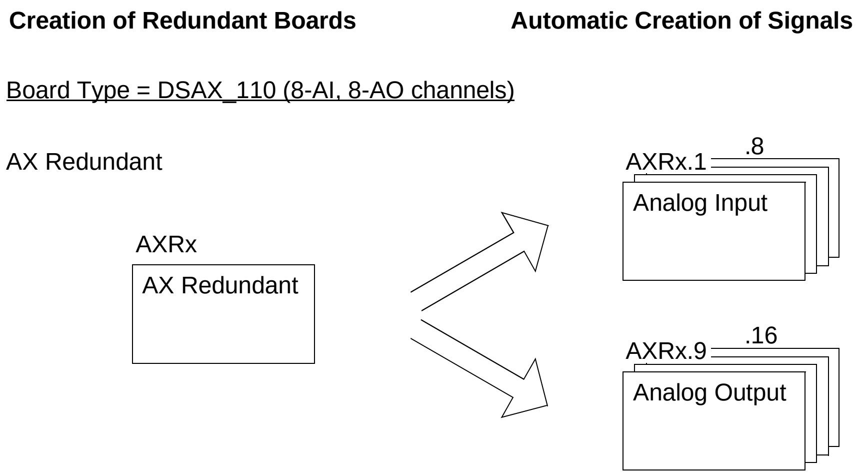

Creation of Redundant Boards
Automatic Creation of Signals
Board Type = DSAX_110 (8-AI, 8-AO channels)
AX Redundant
AXRx
AX Redundant
AXRx.1
.8
Analog Input
AXRx.9
.16
Analog Output

Figure 3-3. Function implementation in software

The following function descriptions are mainly relevant to both single and duplicated hardware.

Divergencies are dealt with in Section Function (notes on S400 I/O).

3.2 Standard Current and Voltage Signal, AO

A number of output boards with different technical data such as number of channels, accuracy, galvanic isolation are available in the Advant Controller system. Local or distributed process connection of standard signals is possible.

There is a board type adapted to redundant applications that can also be used in single applications utilizing the enhanced diagnostic features.

Each board is covering the common standard signal ranges needed for connection of process control actuators. Information of the complete range of circuit boards for local process connection is given in the manuals *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide*.

The same information comprising remote connection is given in *MasterFieldbus and S400 I/O User's Manual*. This document also includes the hardware function of the remote connected boards.

3.2.1 Function

AO board AO

Function of the AO board

The output lines to the process are connected in the connection unit. This unit performs over-voltage suppression.

Different boards have different electrical terminals, e.g. galvanic isolation and signal resolution. All channels on all boards have a D/A-converter and an output amplifier for signal adaptation to current and voltage signals. Each channel can be adapted individually.

Available ranges and how to select them is described in the data base element data sheet for the Analog Output signal. See the manual *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide* for details on hardware.

Address selection: The address to be set is given in the head of the data base element.

Example: the first analog output board uses hexadecimal address 40=0100 0000 (i.e. address bit 6 set).

A red LED indicates faulty or uninitiated board.

Board set-up procedure

The board set-up includes:

1. Implementation
2. Disabling
3. Board type
4. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process communication. If you set IMPL=0 on the board, the board and the channels associated with it are removed from the PDC’s tables at the next scan.

2. Disabling

You can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all CPU load. This function will be used if a board must be unplugged during operation. See Advant Station 500 Series Operator Station manual if Advant Station 500 Series Operator Station is included in your system.

3. Board type selection

Board Type	Connection Units
DSAO_110 has 4 outputs 12 bits + sign. galv. isol.	DSTA_160
DSAO_120 has 8 outputs 12 bits + sign.	DSTA_170
DSAO_130 has 16 outputs 8 bits unipolar	DSTA_180

TYPE must be selected when creating the elements.

Once created, a board type can be changed if the new board type has the same number of channels as the old one. If not, the data base element and all the subordinated signal elements must be deleted.

4. Error handling

The ERR terminal is set in AO board element, if the board is determined non-functional, by the control function.

Indicated errors are non-existent, malfunctioning or improperly strapped hardware or software or data base errors.

The ”ERR” terminal can be connected to the PC program for desired function.

ERR is reset, at hardware errors, automatically within 5 seconds of replacement of the board.

The fault lamp on the board is lit when ERR is set (if the CPU still has access to the board).

Analog Output AOS, AOXS, AOXRS

Function

The Analog Output data base element defines a standard analog output signal. With the element you control the signal processing executed by the process communication program. You can also define the Interface to the Advant Station 500 Series Operator Station system.

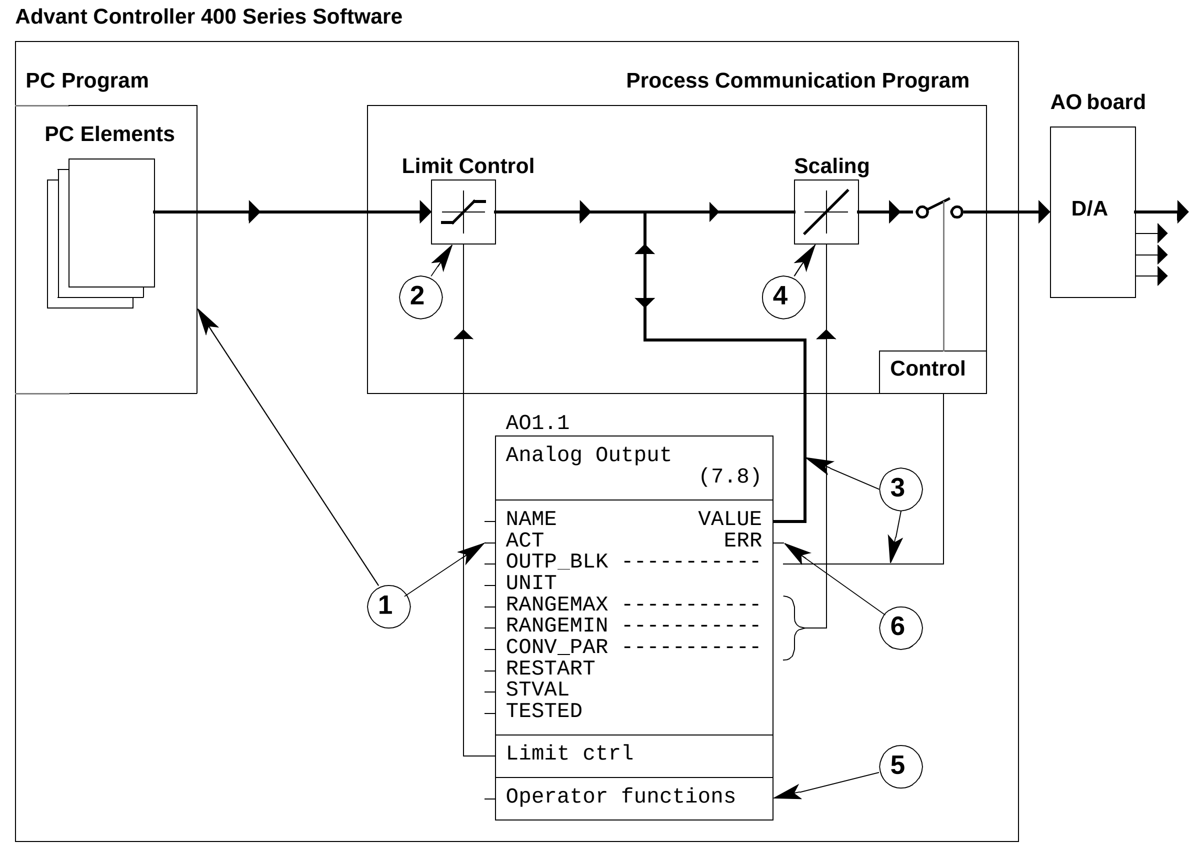
The signal processing includes:

1. Update request
2. Limit Control
3. Update of data base ”VALUE”

4. Scaling
5. Operator Station functions
6. Error handling

The figure below illustrates this process.

Function of Analog Output Terminals, S100 I/O



Further information for applications of S400 I/O via ABB MasterFieldbus can be found in ”Function (notes on S400 I/O)” below.

1. Update request

Update is requested by the PC program connected to the output, by other programs, or from the Advant Station 500 Series Operator Station terminal.

To disable the signal completely, you set ACTivated to 0.

If update requests are received from different sources, they will all be handled, in the sequence received, but only the last one executed in each PC module.

Do not use the same output more than once in your PC programs unless you make sure that the program, control module or block module is OFF for all but one connection, or that they are located in different steps of a sequence. A reset of such a group of outputs will result in one update only.

2. Limit Control

Limit Control can be enabled by setting EN_HI or EN_LO and desired HI_LIM or LO_LIM in engineering units.

When input value is above HI_LIM or below LO_LIM the ”VALUE” and the output signal is limited and ”VALUE_HI” or ”VALUE_LO” is set. The main use is to set a suitable maximum for a process function, as a convenient alternative to hardware limitation.

3. Update of data base ”VALUE”

After limit control the signal is stored in ”VALUE”. In the element, the signal is available for connection to PC programs and for monitoring.

If you set OUTPut_BLocKed, only ”VALUE” is updated, not the physical output. This enables the program to be run without affecting the process.

4. Scaling

All values are used in the system as engineering units.

You enter scaling in two steps:

1. Engineering unit

With RANGE_MAX and RANGE_MIN you determine the scaling of engineering units to output range. The values to be entered are those corresponding to the nominal values in the CONV_PAR.

You may enter the name of the unit in UNIT, for documentation and display purposes.

2. Nominal output range

With CONV_PAR you select output range and type: Bipolar, Unipolar or floating zero, using nominal limits for the physical signal, expressed in volts or mA. See the table for CONV_PARAM for AO.

NOTE 1

Floating zero” ranges (like 4..20 mA) and unipolar/bipolar ranges is a software function selected by CONV_PAR. The actual gain (physical range) is a hardware function that must also be selected on the output board. See the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide*.

NOTE 2

The current (mA) vs. voltage is selected when connecting to the connection unit. See the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide.*

5. Operator Station functions

If Operator Station is included in your system, please refer to the manual *Advant Station 500 Series Basic Functions User’s Guide*.

6. Error handling

The control function for an Analog Output indicates errors via the ERR terminal. ERR is set for all signals of an AO board, AX Redundant or AX unit element when the local or remote board function is defined as non-functional. Missing or incorrectly strapped hardware are typical errors as are errors in software or data base elements. For AX units it is possible that the error is in the bus communication (ABB MasterFieldbus).

ERR is set in the signal element if the AO board is not implemented.

The LED on the board front shows steady light if ERR is set (provided that the CPU has access to the board).

ERR is reset within 10 seconds of replacement of the non-functional hardware unit.

Signal Ranges for each AO board

CONV_PARAM for AO

Available for Signal range	**AO board**			
	DSAO 110	**DSAO 120**	**DSAO 130**	**DSAX 452**
–10..10 V	X	X		
–5..5 V	(X)			
–2.5..2.5 V	(X)			
–1.25..1.25 V	(X)			
0..10 V	X	X	X	X
0..5 V	(X)			
0..2.5 V	(X)			
0.25..1.25 V	(X)			
2..10 V	X	X	X	X
1..5 V	(X)			
0.5..2.5 V	(X)			
0.25..1.25 V	(X)			
–20..20 mA	X	X		
–10..10 mA	X			
–5..5 mA	(X)			
0..20 mA	X	X	X	X
0..10 mA	X	X		
0..5 mA	(X)			
4..20 mA	X	X	X	X
2..10 mA	X	X		
1..5 V	(X)			

Range is entered exactly as given above (upper case not significant).

Ranges marked as ”X” are available by strapping and connection to the voltage or current terminal on the connection unit.

Ranges marked as ”(X)” are available by strapping and adjustment of one potentiometer per channel: R136, R236, R336 resp. R436.

Range example:

If the motor speed 400 rpm is to be represented as 20 mA and 0 rpm as 4 mA set:

CONV_PAR=4..20 mA

UNIT=rpm

RANGE MIN=0

RANGE MAX=400

Optionally, set

EN_LO=1

LO_LIM=0

EN_HI=1

HI_LIM=400

If limits are not set, output of negative values, represented as 0-4 mA or even negative signal, will be possible.

Update of values at system inits

The value to be used at system init is determined by the RESTART terminal. The value retained in the VALUE terminal since the last execution is used if RESTART=VALUE.

The VALUE terminal is updated with the value of STVAL if RESTART=STVAL and the signal is simultaneously put out on hardware.

Function (notes on S400 I/O)

Output of analog signals is handled by an AX unit connected to a Advant Controller 400 Series via MasterFieldbus.

An AX unit’s software configuration is determined through an AX unit data base element in Advant Controller 400 Series.

Such an element is comparable to an AO board element for an analog output unit located in the Advant Controller 400 Series framework.

All handling of the individual signal, and it’s Analog Output element is the same regardless of whether local or S400 I/O is used. See below for a minor difference.

Communication error function

The scaling function has been moved to AX units. The AX units also contain the terminals RESTART and STVAL. These terminals are used to determine the output value if the unit should not be updated within 0.2 seconds. This can occur if the communication is broken.

AX Redundant AXR

Function

Miscellaneous

The AX Redundant (board) data base element covers a pair of equal boards. A board in such a pair has either analog input channels or both analog input and output channels. The pair of boards are connected to one common connection unit. The process signal lines shall be connected to this common connection unit.

Board 1 is selected to be on duty during start up of a redundant board pair, causing ACT_BRD=1. A function check is executing in parallel for both boards.

This board x on duty term means:

- Input signal:

  The value of board x is used.

- Output signal:

  50% comes from board x and 50% from the other board, if the other board is free from error,
  otherwise 100% comes from board x.

If the self test for board 1 detects an error, this board is assigned error indication and board 2 is selected to be on duty. This transition takes place during the same scan period as the error is detected.

When board 1 has been exchanged, the new correct unit is started up and becomes backup. If the new correct board 1 is preferred to be the one on duty, board 2 can be pulled out, a manual Operator Station change-over can be made or the value of ACT_BRD can be changed.

The AX redundant data base element has subordinated channel elements. A subordinated analog input channel element has the call name AIXRS and the item designation AXRx.y where x=board number and y=signal number. A subordinated analog output channel element has the call name AOXRS and the item designation AXRx.z where z=signal number. Otherwise these subordinated elements correspond to ordinary analog input element AIS and to ordinary analog output element AOS respectively.

Use the entry "Number of REDUNDANT/OBJECT_BOARDS" in DIMDB to dimension for the AXR element type.

You can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all Central unit load. This function will be used if a board must be unplugged during operation. If Advant Station 500 Series Operator Station is included in your system - see the Advant Station 500 Series Operator Station manuals.

Signal Ranges

Conversion Parameters, DSAX 110 Input channels

Voltage	0.. 10 V	0.. 5 V	2.. 10 V	1.. 5 V
Current	0.. 20 mA	4.. 20 mA	–	–

See the AI board section for corresponding DSAI_133 board data.

Secure correspondence between the CONV_PAR value and current/voltage strapping at the assigned connection unit.

ADDRx - address of board no x

Check manually if a default address value will cause any conflict with other boards, because none automatic check of this is performed. Default values are calculated as far as there is space enough within the address range (192-239) for OTHER boards, otherwise a zero value is presented. The ADDR1 is calculated using the formula:

190 + rec_no×2 (where rec_no is the record number in the data base for this element).

The ADDR2 is calculated using the formula:

191+rec_no×2

In case of a zero default address value - use an unoccupied address in the space among AI, AO, DI and DO boards, eg address 32..191.

Enter the address as a decimal number, which is then converted to binary format and displayed in the element head.

It is possible to only have one board installed, then the ADDR2 terminal shall be set to 0. It is not allowed to set a zero value on ADDR1 and an address in ADDR2.

3.2.2 Data Base Elements

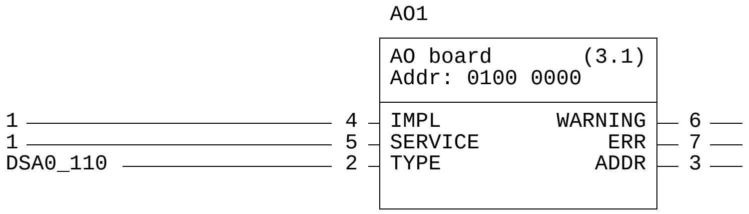
3.2.2.1 AO board

AO board AO

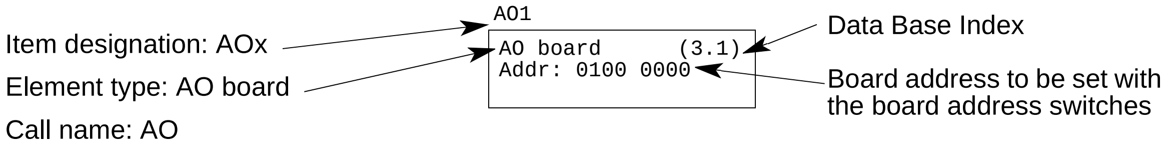
Summary

The AO board data base element holds the data values of the terminals associated to an analog output board for standard current and voltage signals. The element is superior to the signal elements associated to the analog output channels in the board.

Overview



Head



Terminal Description

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
4	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
5	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–

Terminal Description (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	TYPE	user	DSAO_110	–	Board **TYPE**: DSAO_110, DSAO_120 or DSAO_130.	TYPE must be selected when creating the element. The full name including ”_” must be entered.
6	WARNING	system	–	B(r)	**WARNING** for less serious (non-fatal) software failures in program or data base.	Output continues.
7	ERR	system	–	B(r)	**ERR**or flag indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

3.2.2.2 AX unit

Implementation in Advant Controller 400 Series of analog signals physically connected to a remote I/O unit is carried out with a data base element AX unit.

For the time being a single board type combining 14 analog inputs and 6 analog outputs is available. The element AX unit supports both analog inputs and outputs.

Please refer to Section 3.2.2.2 AX unit.

3.2.2.3 AX Redundant

Implementation in Advant Controller 400 Series of redundant analog circuit boards is carried out with a data base element AX Redundant.

The element supports available boards including analog inputs only and boards including both inputs and outputs.

Please refer to Section 3.2.2.3 AX Redundant.

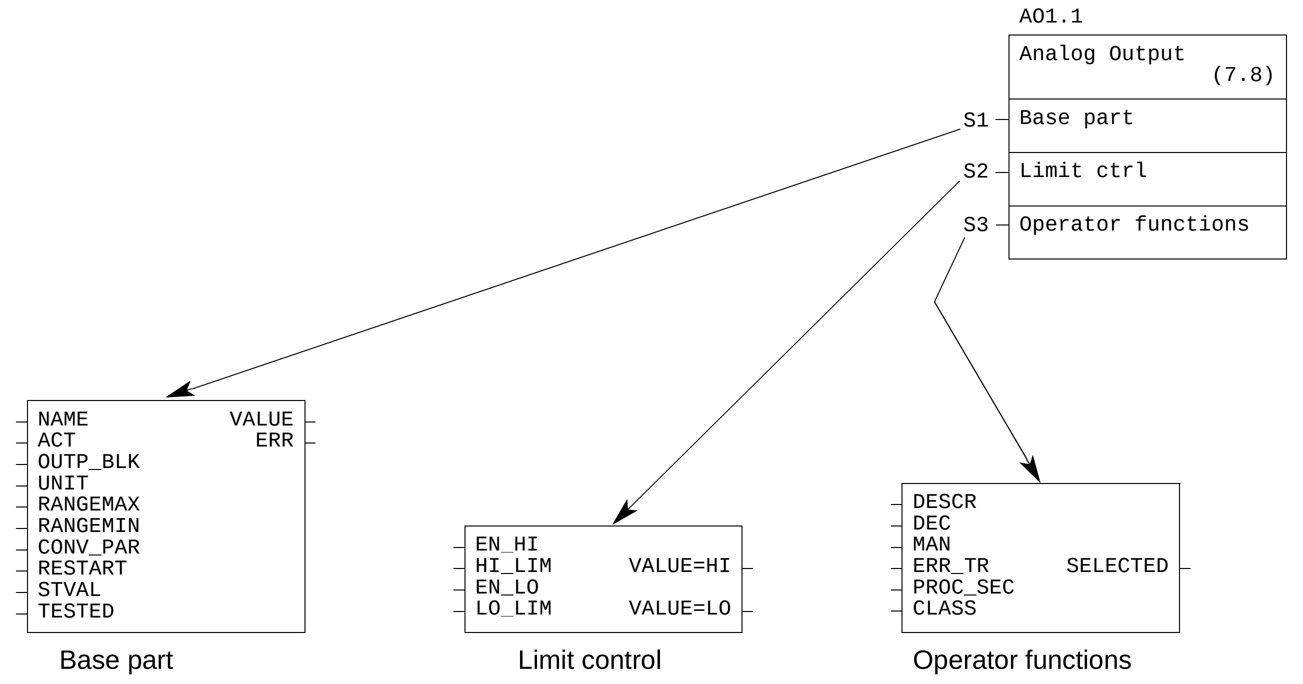
3.2.2.4 AO channel

Analog Output AOS, AOXS, AOXRS

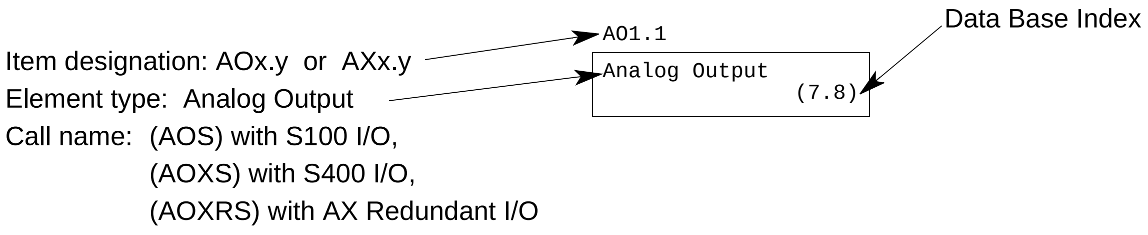
Summary

The data base element Analog Output is subordinate to the AO board data base element, the AX unit data base element or the AX Redundant data base element.

Overview

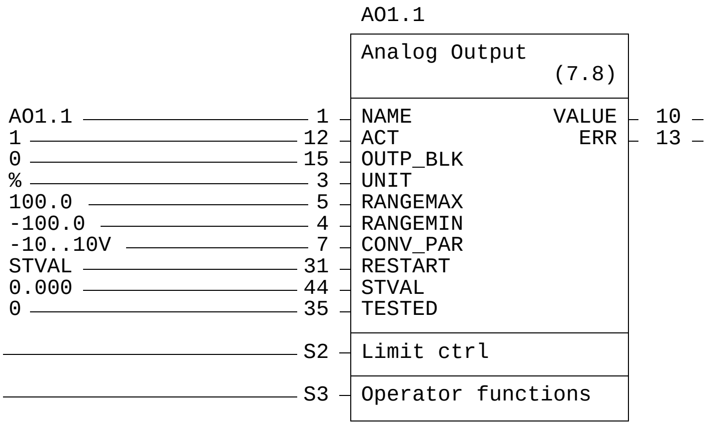


Head



Item designation: AOx.y or AXx.y
Element type: Analog Output
Call name: (AOS) with S100 I/O,
(AOXS) with S400 I/O,
(AOXRS) with AX Redundant I/O

Base part



Terminal Description, Base part

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
1	NAME	user	AOx.y, AXx.y *or* AXRx.y	–	Each Analog Output signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
21	ACT	user	1	B(r)	1=the signal is **ACT**ive 0=the signal is spare	–
15	OUTP_BLK	dialog	0	B(r/w)	1=board **OUTP**ut is **BL**oc**K**ed.	VALUE will still be updated.
3	UNIT	user	%	–	The signal **UNIT** in engineering unit. Empty string is entered as a dot (.).	Maximum 6 characters shown in Operator Station and data base element.
5	RANGEMAX	user	100.0	R(r)	**RANGE MAX**imum input for VALUE in engineering unit.	Derives scaling.
4	RANGEMIN	user	–100.0	R(r)	**RANGE MIN**imum input for VALUE in engineering unit.	Derives scaling. Default for AOXRS: 0.0
7	CONV_PAR	user	–10..10V	–	Output signal range in Volts or mA.	Refer to the table for Conversion parameters for S100 I/O. Must also be strapped in AO board.
31	RESTART	user	STVAL	B(r/w)	**RESTART** selects output value at system restart. STVAL=restart value defined by terminal STVAL; VALUE=the last value is selected as restart value.	–

Terminal Description, Base part (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
44	STVAL	user	0.0	R(r/w)	**ST**art **VAL**ue for output.	–
35	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
10	VALUE	system, user	–	R(r/w)	Output signal **VALUE** in engineering unit.	–
13	ERR	system	–	B(r/w)	**ERR**or.	–

Signal Ranges

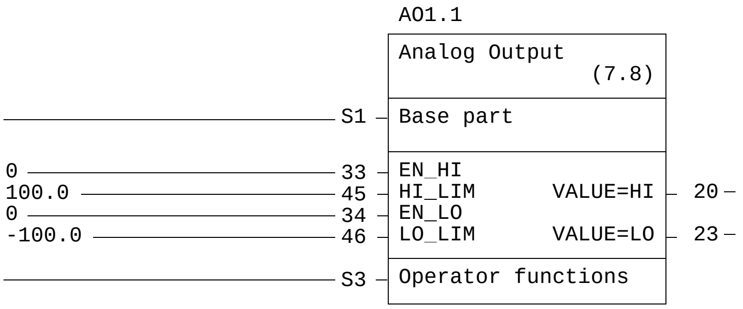
Conversion Parameters, S100 I/O

Voltage	–10.. 10 V	–5.. 5 V	–2.5.. 2.5 V	–1.25.. 1.25 V	0.. 10 V	0.. 5 V	0.. 2.5 V	0.. 1.25 V	2.. 10 V	1.. 5 V	0.5.. 1.25 V	0.25.. 1.25 V
Current	–20.. 20 mA	–10.. 10mA	–5.. 5 mA	0.. 20 mA	0.. 10 mA	0.. 5 mA	0.. 2.5 mA	4.. 20 mA	2.. 10 mA	1.. 5 mA	–	–

Conversion Parameters, MasterFieldbus (S400 I/O)

Voltage	0.. 10 V	2.. 10 V
Current	0.. 20 mA	4.. 20 mA

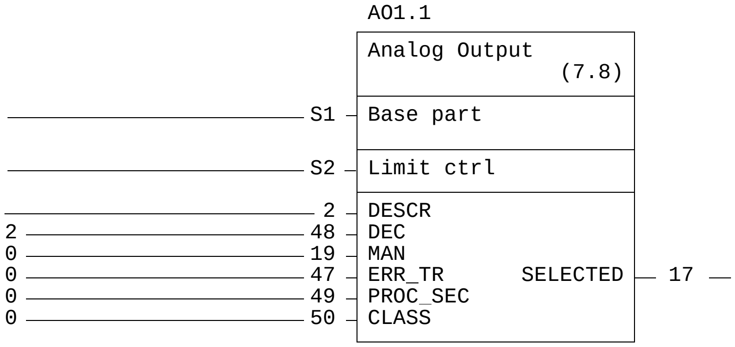
Limit control



Terminal Description, Limit control

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
33	EN_HI	user	0	B(r/w)	**EN**ables limitation of output signal to **HI**gh limit.	–
45	HI_LIM	user	100.0	R(r/w)	**HI**gh **LIM**it for output signal in engineering unit.	–
34	EN_LO	user	0	B(r/w)	**EN**ables limitation of output signal to **LO**w limit.	–
46	LO_LIM	user	–100.0	R(r/w)	**LO**w **LIM**it for output signal in engineering unit.	–
20	VALUE=HI	system	–	B(r/w)	Flag indicating that the output **VALUE** has been limited to **HI**gh limit.	–
23	VALUE=LO	system	–	B(r/w)	Flag indicating that the output **VALUE** has been limited to **LO**w limit.	–

Operator functions



Terminal Description, Operator functions

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
48	DEC	user	2	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
19	MAN	dialog	0	B(r/w)	Flag indicating that **MAN**ual control by Operator Station operator has been selected.	0=Controlled and updated by PC program.
47	ERR_TR	user	0	–	**ERR**or **TR**eatment.	Not used.
49	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the object handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
50	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
17	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

3.3 Calculated Analog Output, AOC

The purpose of the AO Calculated element is to supply Operator Station functions - similar to those for an analog output - to any numerical value used by a PC-program. A typical application is manually entering from an Advant Station 500 Series Operator Station of a reference value with magnitude limitations.

In connection with this manual operation there is a built in feature of output value tracking in a defined AUTO-mode. In other words the value can be controlled either from operator or from PC-program depending on the selected control mode, MAN or AUTO, of the functional unit.

3.3.1 Function

AO Calculated AOC

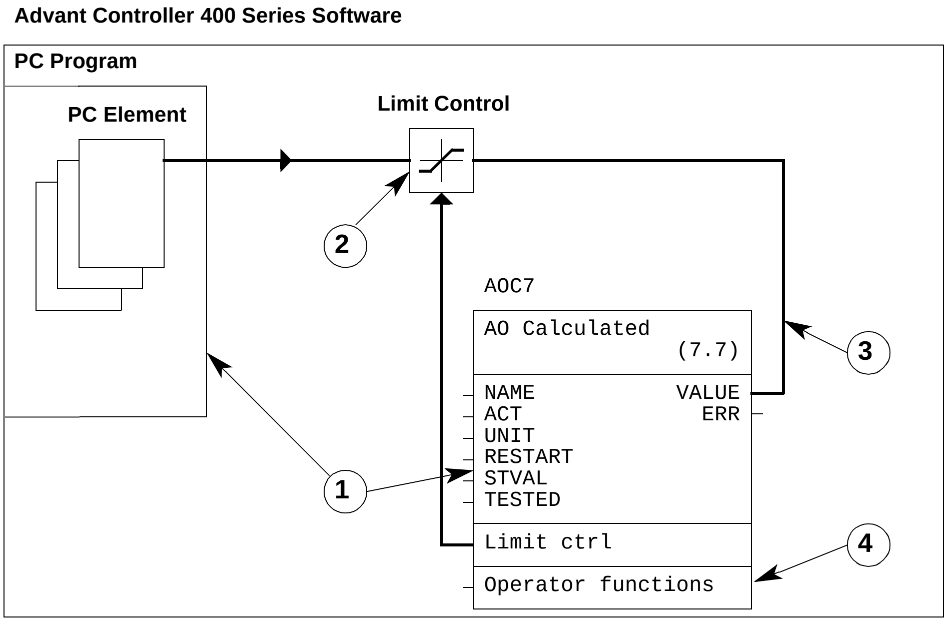
Function

The AO Calculated data base element defines an internal analog output. The value will not be put out on hardware but all MMC functions associated to an analog output will be available for the value.

The signal processing includes:

1. Update request
2. Limit control
3. Update of data base ”VALUE”
4. Operator Station functions
5. Update of values at system inits

Function of AO Calculated Terminals



The figure on the previous illustrates this process.

1. Update request

Update is requested by the PC program connected to the output, by other programs or from the Operator Station terminal.

To disable the signal completely, you set ACTivated to 0.

If update requests are received from different sources, they will all be handled in the sequence received, but only the last one executed in each PC module.

Do not use the same output more than once in your PC programs unless you make sure that the program, control module or block module is OFF for all but one connection, or that they are located in different steps of a sequence. A reset of such a group of outputs will result in one update only.

2. Limit control

Limit Control can be enabled by setting EN_HI or EN_LO and desired HI_LIM or LO_LIM in engineering units.

When input value is above HI_LIM or below LO_LIM the ”VALUE” is limited and ”VALUE=HI” or ”VALUE=LO”is set.

3. Update of data base ”VALUE”

After limit control the signal is stored in ”VALUE”. In the element, the signal is available for connection to PC programs and for monitoring.

4. Operator Station function

If Operator Station is included in your system, please refer to the manual *Advant Station 500 Series Basic Functions User’s Guide*.

Update of values at system inits

The value to be used at system init is determined by the RESTART terminal. The value retained in the VALUE terminal since the last execution is used if RESTART=VALUE.

The VALUE terminal is updated with the value of STVAL if RESTART=STVAL.

3.3.2 Data Base Elements

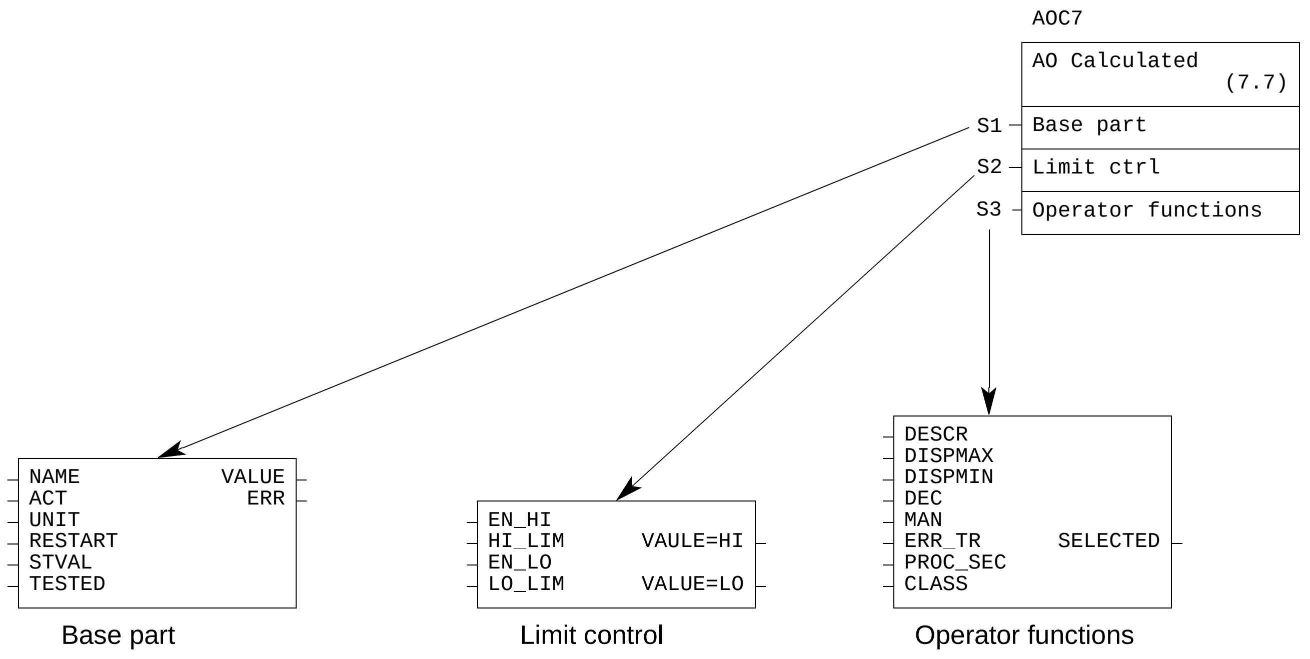
3.3.2.1 AOC channel

AO Calculated AOC

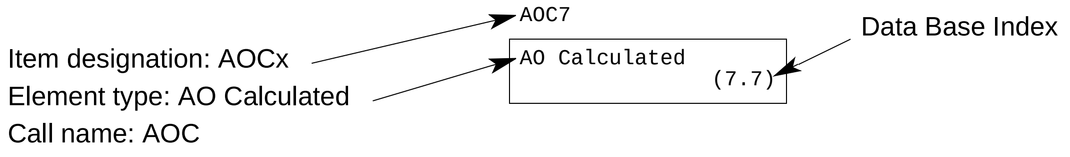
Summary

The purpose of the AO Calculated data base element is to supply Operator functions - similar to those for an analog output - to any numerical value. The AO Calculated data base element holds data for these functions.

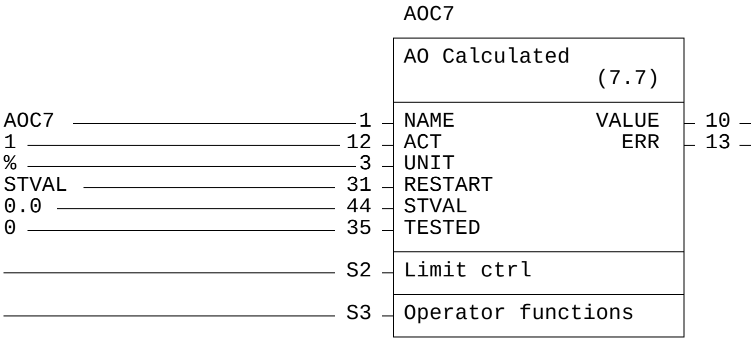
Overview



Head



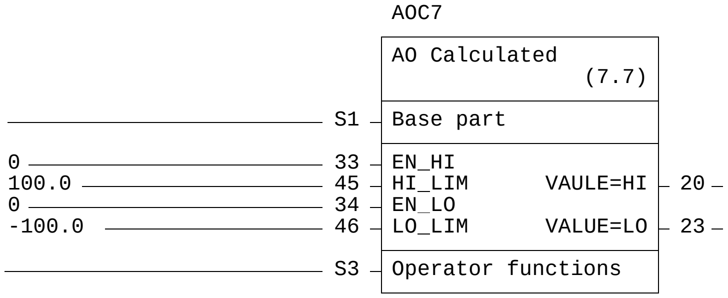
Base part



Terminal Description, Base part

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
1	NAME	user	AOCx	–	Each AO Calculated signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
12	ACT	user	1	B(r)	1=the signal is **ACT**ive 0=the signal is spare	–
3	UNIT	user	%	–	The signal **UNIT** in engineering unit.	Maximum 6 characters. Shown in Operator Station and data base element.
31	RESTART	user	STVAL	B(r/w)	**RESTART** selects output value at system restart. STVAL=restart value defined by terminal STVAL VALUE=the last value is selected as restart value	–
44	STVAL	user	0.0	R(r/w)	**ST**art **VAL**ue for output.	–
35	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
10	VALUE	system	–	R(r/w)	Signal **VALUE** in engineering unit.	–
13	ERR	system	–	B(r/w)	**ERR**or. 1=configuration error.	Can only be reset by correcting the error.

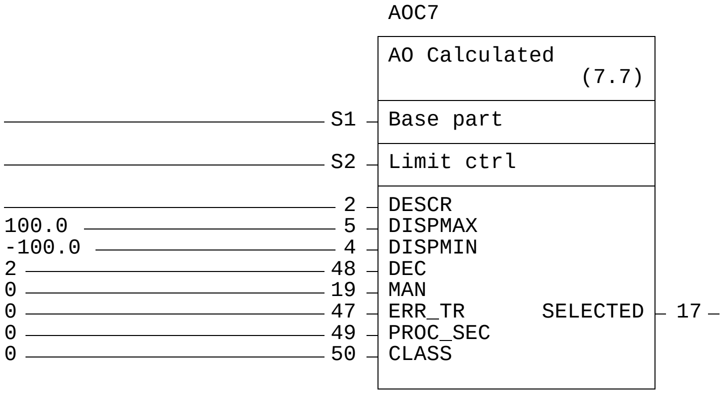
Limit control



Terminal Description, Limit control

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
33	EN_HI	user	0	B(r/w)	**EN**ables limitation of output signal to **HI**gh limit.	–
45	HI_LIM	user	100.0	R(r/w)	**HI**gh **LIM**it for output signal in engineering unit.	–
34	EN_LO	user	0	B(r/w)	**EN**ables limitation of output signal to **LO**w limit.	–
46	LO_LIM	user	–100.0	R(r/w)	**LO**w **LIM**it for output signal in engineering unit.	–
20	VALUE=HI	system	–	B(r/w)	Flag indicating that the output **VALUE** has been limited to **HI**gh limit.	–
23	VALUE=LO	system	–	B(r/w)	Flag indicating that the output **VALUE** has been limited to **LO**w limit.	–

Operator functions



Terminal Description, Operator functions

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
5	DISPMAX	user	100.0	R(r)	**DISP MAX**imum output in engineering unit.	Derives scaling.
4	DISPMIN	user	–100.0	R(r)	**DISP MIN**imum output in engineering unit.	Derives scaling.
48	DEC	user	2	–	The number of **DEC**imals to be presented by Operator Station.	0..6 decimals.
19	MAN	dialog	0	B(r/w)	Flag indicating that **MAN**ual control by Operator Station operator has been selected.	0=Controlled and updated by PC program.
47	ERR_TR	user	0	–	**ERR**or **TR**eatment. Not used.	–
49	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the object handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
50	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
17	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	Cannot be operated by user.

3.4 Operator Station Functions

The operator station function is divided in principle into three parts:

- Presentation. Display elements, Time logged properties
- Dialog
- Event handling.

3.4.1 Presentation

Display elements which can be used for different display types are available for used in the functional unit Analog Output.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display.

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual.*

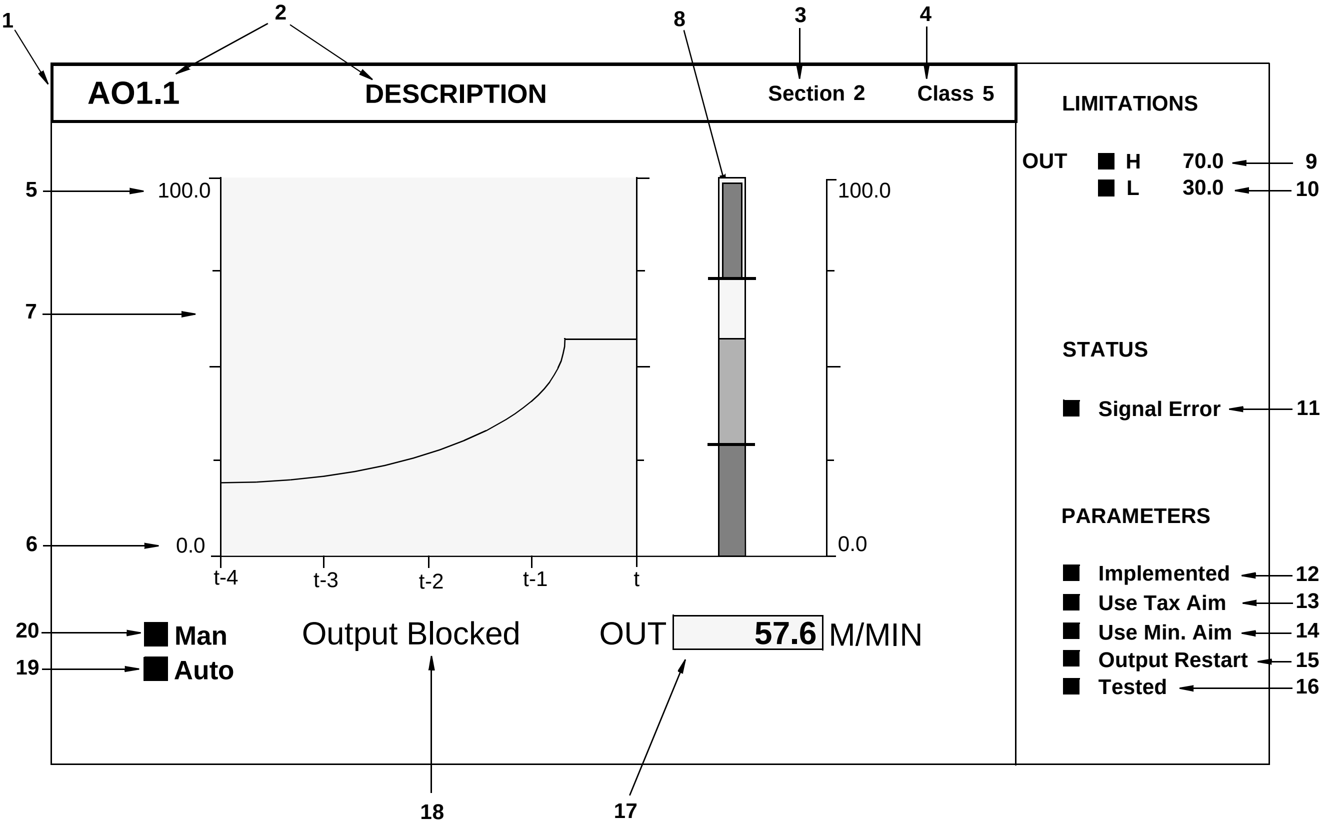
Detailed information of alternative way of presentation of certain status and data within the displays such as color, flashing, blocked etc. is given in the reference manual.

Time-logged Properties

Measured values stored can be presented graphically in form of curves on the display screen. Such a display, a **trend display**, can consist of 1-4 curves.

For the functional unit Analog Output the output value can be logged and presented. The logged property is designated OUT.

Object display: AOOB01

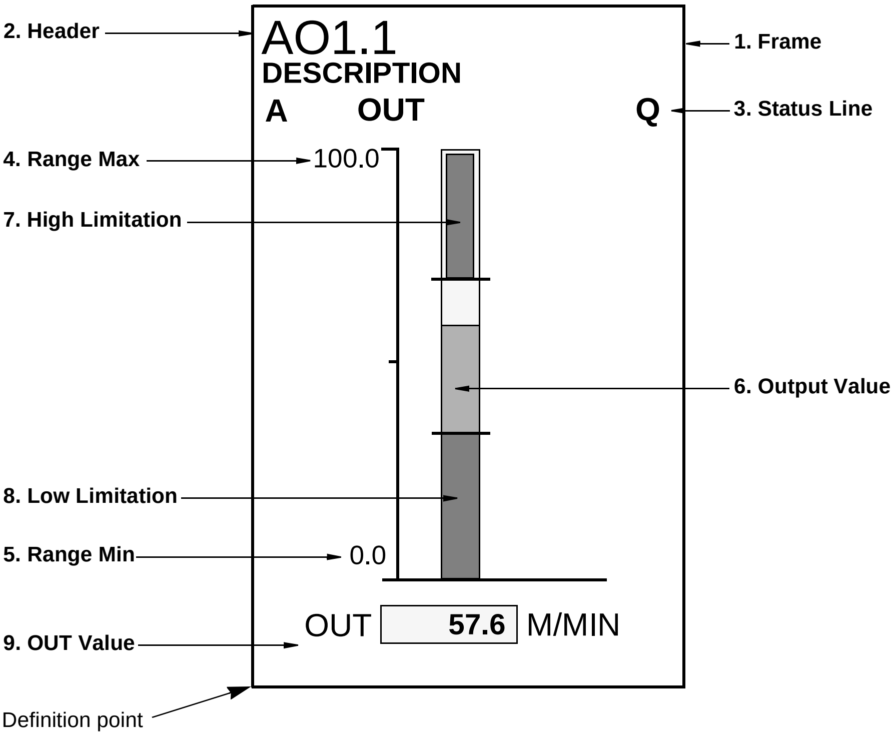


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3.1	Section Text	
3.2	Section Value	Process section
4.1	Class Text	
4.2	Class Value	Object class
5	Range Max	Range Max of the MV value
6	Range Min	Range Min of the MV value
7	Output Value Trim Curve	Object output value
8.1	Output Value Bargraph	
8.2	High Limitation	High limitation
8.3	Low Limitation	Low limitation
9	LIMITATIONS	Limitations for OUT
9.1	High Limitation Indication	
9.2	H Text	
9.3	H Value	High limitation value
10.1	Low Limitation Indication	
10.2	L Text	
10.3	L Value	
11	STATUS	
11.1	Signal Error Indication	
11.2	Signal Error Text	
12	PARAMETERS	
12.1	Implemented Indication	
12.2	Implemented Text	
13.1	Use Max Lim Indication	
13.2	Use Max Lim Text	
14.1	Use Min Lim Indication	
14.2	Use Min Lim Text	
15.1	Output Restart Indication	
15.2	Output Restart Text	
16.1	Tested Indication	

No	Description	Remarks
16.2	Tested Text	
17.1	OUT Text	
17.2	OUT Unit	
18	Output Blocked	

No	Description	Remarks
19.1	Auto Indication	
19.2	Auto Text	
20.1	Man Indication	
20.2	Man Text	

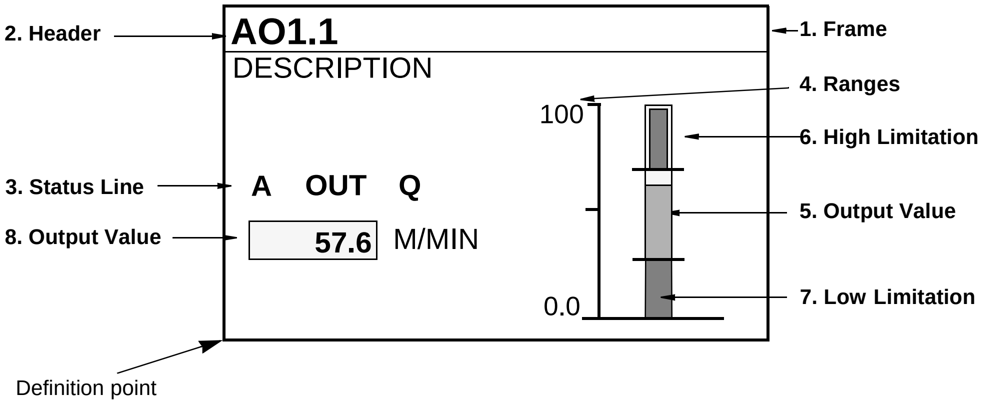
Display Element for Group display: AOGR01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Output Blocked	
3.3	Error Indication	
4	Range Max	Range Max of the MV value
5	Range Min	Range Min of the MV value

No	Description	Remarks
6	Output Value Bargraph	
7	High Limitation	High limitation
8	Low Limitation	Low limitation
9	Output Value	
9.1	OUT	
9.2	OUT Value	
9.3	OUT Unit	

Display Element for Object closeup display: AOOWI01

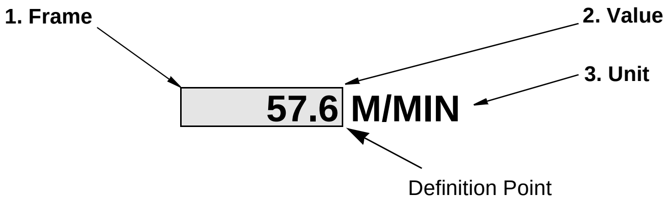


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	
3.2	Output Blocked	
3.3	Error Indication	
4.1	Range Max	Range Max of the MV value

No	Description	Remarks
4.2	Range Min	Range Min of the MV value
5	Output Value Bargraph	
6	High Limitation	High limitation
7	Low Limitation	Low limitation
8.1	OUT Value	
8.2	OUT Unit	

Display Element for Process display:

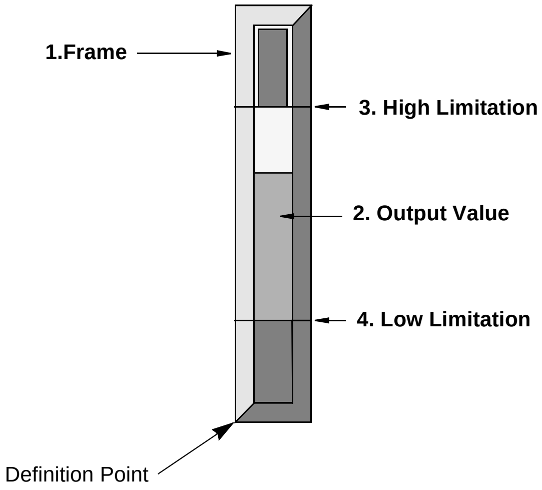
AOPD01



No	Description	Remarks
1	SelectFrame	
2	Output Value	

No	Description	Remarks
3	Limit	

AOPD51



No	Description	Remarks
1	SelectFrame	
1.2	TopLeftEdge	Three Dimensions effect
1.3	BottomRightEdge	Three Dimensions effect

No	Description	Remarks
2	High Limitation	High limitation
3	Low Limitation	Low limitation
4	Output Value	

3.4.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.

The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit Analog Output has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog but no subdialogs. The MAX dialog consists of an output dialog with 2 subdialogs.

MIN dialog (No authority key)

Keyboard keys

+ ↑	**Increase**	Increase output value with 1 % (+Shift: 10 %)
↓ −	**Decrease**	Decrease output value with1 % (+Shift: 10 %)
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display

Dynamic keys, Keyboard

D1 ↑ Increase	D2	D3	D4	D5
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 1 %
Decrease	Decrease output value with 1 %
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
+ ↑	**Increase**	Increase output value with 1 % (+Shift: 10 %)
↓ −	**Decrease**	Decrease output value with 1 % (+Shift: 10 %)
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1 Block Output	D2 OUT H 70.0	D3	D4	D5
D6 Deblock Output	D7 OUT L 30.0	D8	D9	D10 *Keyboard...*

Block Output	Block output signal
OUT H	Check/change max limit
Deblock Output	Deblock output signal
OUT L	Check/change min limit
Keyboard...	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard...

D1 ↑ Increase	D2 Man	D3 Auto	D4	D5
D6 ↓ Decrease	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

Increase	Increase output value with 1 %
Man	Set to manual mode
Auto	Set to automatic mode
Decrease	Decrease output value with 1 %
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

3.4.3 Event Handling

There is no event handling included in the functional unit Analog Output If event handling is wanted, use Calculated Analog Input.

3.5 Function Diagram

The function diagram in section A.3 in Appendix A describes in detail the relation between all input and output signals in the functional units. Figure A-1 in Appendix A explains the used designations in the circuit diagram.

Chapter 4 Digital Inputs

The functional unit Digital Input is a part of the Advant OCS system. The unit incorporates functions for:

- Scanning of digital process inputs.
- Filtering and inversion of such inputs.
- Storage of input data
- Update blocking and input simulation
- Operator station functions.

There is a version of Digital Input for internally calculated "input value" with no connection to hardware.

All these utilities make the unit a powerful tool for implementing process supervision and control. The existence of pre-configured functions, beyond the basic ones for data storage and input scanning and storage, means that the application engineering time, and cost, can be significantly reduced.

4.1 Configuration

The functional unit Digital Input consists of a number of hardware and software parts:

- An input channel of a digital input board
- A data base element for storage of parameters describing the input board used and defining its function. A data base element may be seen as the outward representation of a data record. The existence of data base elements for input board description facilitates easy change of board type and various functional parameters.
- A data base element for storage of the process input signal and various other descriptive properties and control parameters. The purpose of using a data base element for input storage is to achieve convenient access to all relevant data at one place only.
- Operator station functions consisting of pre-configured presentation, dialog, event and alarm handling.

All these parts relate to each other according to the Figure 4-1.

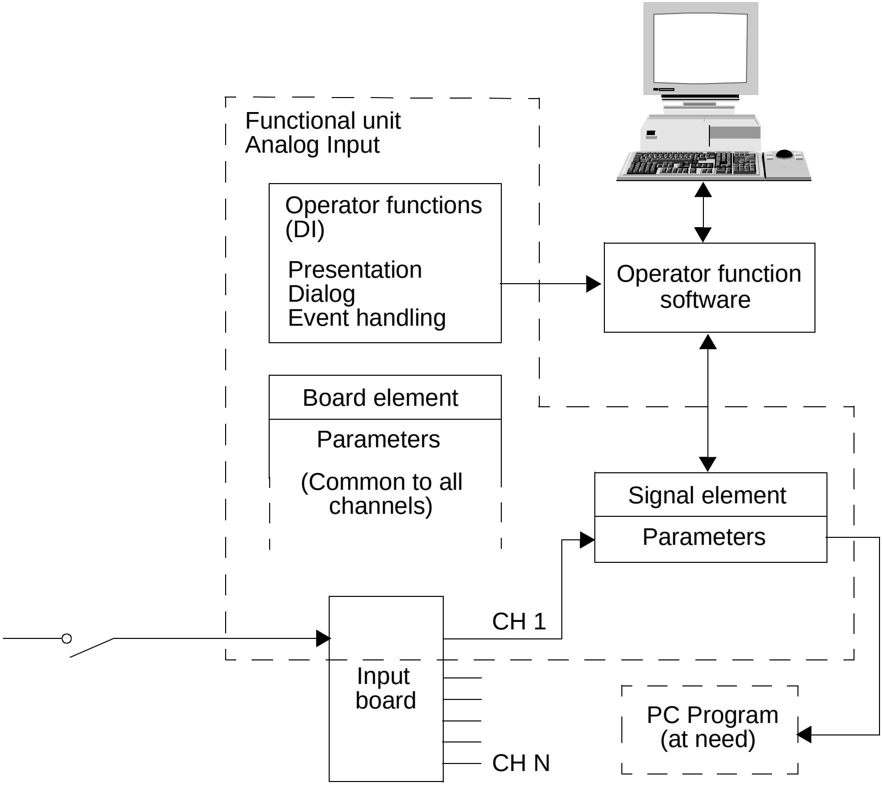


Figure 4-1. The structure of the functional unit Digital Input

4.2 Digital Input, DI

A number of input boards with different technical data such as number of channels, rated input voltage, DC or AC etc. are available in the MasterPiece system. Local or distributed process connection of digital signals is possible.

Information of the complete range of circuit boards for local process connection is given in the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide*.

The same information comprising remote connection is given in *MasterFieldbus and S400 I/O User's Manual*. This document also includes the hardware function of the remote boards.

4.2.1 Function

DI board DI

Hardware function of the DI board

The process signal lines are connected in the connection unit. This unit contains overvoltage protection and fuses. Different boards have different electrical terminals (e.g. different signal levels and adaptation to AC or DC current). Galvanic isolation is provided by optocupled inputs.

A microprocessor on the board reads the inputs at about 1 ms scanning rate, handles filtering and puts the filtered value in a register.

If selected, the microprocessor also gives the system processor an interrupt and stores a time tag ”telegram”, 9 such time tag telegrams can be queued for handling in the system processor.

A red LED indicates a fault or uninitated board. Yellow LED's indicate the state of the output registers.

Address selection: The address to be set is given in the head of the data base element.

Example: The first digital input board is located at hexadecimal address 60=0110 0000.

For board data and strappings, please refer to the manuals *Advant Controller 410 User’s Guide* and *Advant Controller 450 User’s Guide*.

Board set-up procedure

The board set-up includes:

1. Implementation
2. Disabling
3. Board type selection
4. Scantime selection
5. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the process communication. If you set IMPL=0, the board, and the channels associated with it, are removed from the PDC's tables. Scanned boards are removed at the next scan.

2. Disabling

From Advant Station 500 Series Operator Station you can disable and later enable a board, using the status information dialog. This saves some but not all CPU-load.

If Advant Station 500 Series Operator Station is included in your system: see the Advant Station 500 Series Operator Station manuals.

3. Board type selection

Board type	Value
DSDI_110	32 ch. for 24 V DC
DSDI_115	32 ch. for 24 V DC
DSDI_116	32 ch. for 24 V DC
DSDI_120	32 ch. for 48 V DC
DSDI_125	32 ch. for 48 V DC
DSDI_126	32 ch. for 48 V DC
DSDI_131	16 ch. for 110 V AC/DC
DSDI_141	16 ch. for 220 V AC/DC

Once created, a board type can be changed if the new board type has the same number of channels as the old one. Please note that a DSDI_110 or DSDI_120 board may be exchanged for a DSDI_115, 116, 125 or 126 board only if the board has been scanned.

4. Scantime selection

The board may work in either interrupt mode or scanning mode as specified by SCANTime. In interrupt mode there is no load on the system CPU unless an input is changing state.

When an input is changing often, the load is lower using scanned mode with appropriate scan-time.

5. Error handling

The ERR terminal is set in DI board data base element, if the board is determined non-functional by the control function.

Indicated errors are non-existent, malfunctioning or improperly strapped hardware or software or data base errors.

The ”ERR” terminal can be connected to the PC program for the desired function.

ERR is reset, if hardware error, automatically within 5 seconds of replacement of the board.

The fault lamp on the board is lit when ERR is set (if the CPU still has access to the board).

Digital Input DIS, DIXS

Function

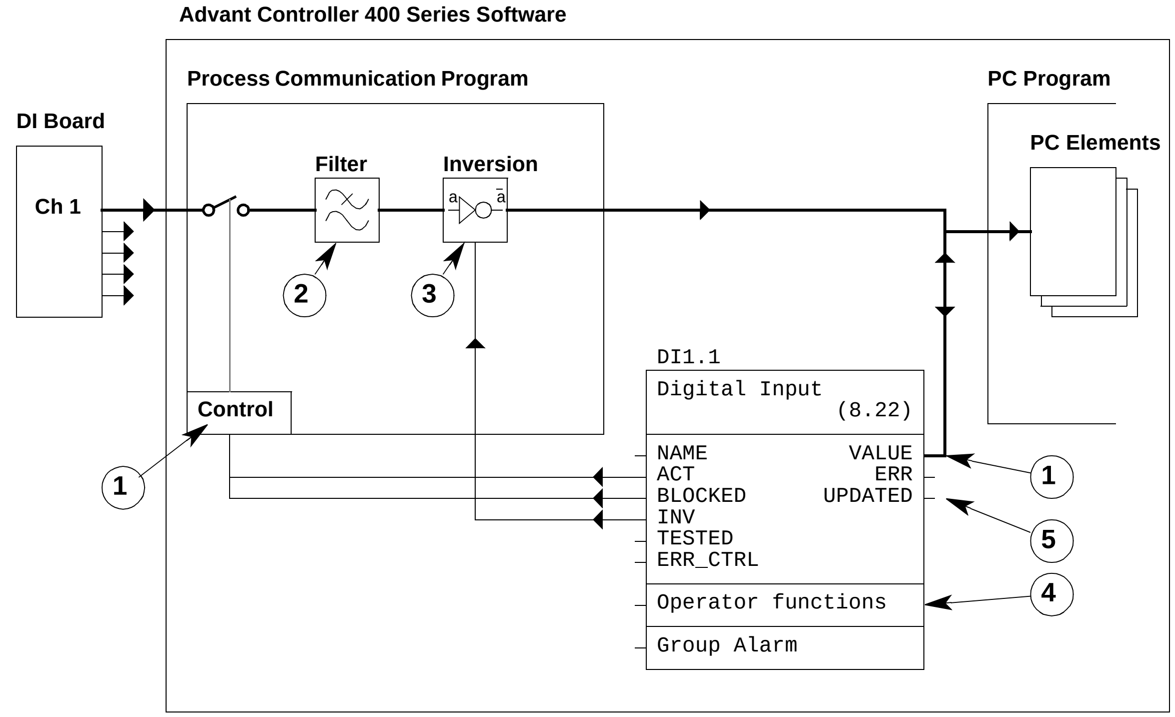
With the data base element you control the signal processing executed by the data communication program. You can also define the interface to the Advant Station 500 Series Operator Station system.

The signal processing includes:

1. Updating
2. Filtering
3. Inversion
4. Operator Station function
5. Error handling

The figure below illustrates this process.

Function of Digital Input Terminals, S100 I/O



See ”Function (notes on S400 I/O)” for further information on applications using S400 I/O via ABB MasterFieldbus.

1. Updating

The ”VALUE” is updated at intervals determined by the terminal SCANTime in the DI board data base element if the board has been scanned.

You should set SCANT to the requirements of your system.

If you set BLOCKED, the data acquisition stops, allowing manual entry of ”VALUE”.

To disable the data acquisition completely, you set ACTivated to 0. This excludes the input from processing.

2. Filtering

With the DI board element you may select filter time for groups of 8 input signals.

The input must be stable for so many ms as given by the filter time.

The filter should be used to avoid ”bounce” from switches and reduce the number of interrupts.

3. Inversion

If you set the INVert terminal, the ”VALUE” will be 0 when the electric signal is on and ”VALUE” will be 1 when it is off. This is suitable when the logical sensor function is the inverse of the electrical.

4. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation.

5. Error handling

The supervision function for an Digital Input indicates errors via the ERR terminal. ERR is set for all signals of a DI board or DX unit element when the local or remote board function is defined as non-functional. Missing or incorrectly strapped hardware are typical errors as are errors in software or data base elements. For DX units it is possible that the error is in the bus communication (ABB MasterFieldbus).

ERR is set in the signal element if the DI board is not implemented.

The LED on the board front shows steady light if ERR is set (provided that the CPU has access to the board). ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional hardware unit.

Function (notes on S400 I/O)

The digital data acquisition is handled by a remote DX unit connected to a Advant Station 500 Series Operator Station via MasterFieldbus. A DX unit's software configuration is determined through a DX unit data base element in Advant Controller 400 Series. Such an element is comparable to a DI board element for a digital input unit located in the Advant Controller 400 Series framework.

All handling of the individual signal, and it's Digital Input element, is the same regardless of whether S100 or S400 I/O is used. See below for some minor differences.

Updating

S400 I/O cannot match the time resolution obtainable with S100 I/O and interrupt-controlled input signals. Several asynchronous program functions delays the remote digital data acquisition function.

- DX units read and filter process data with a scan time interval of 2 ms. This means that the time resolution of filtered values is 2 ms.
- The scan time interval of the communication depends on the number of units of different types that are connected to the bus. 10 ms is a typical value.
- The scan time value of the DX unit element determines how often the values are updated in the data base and how quick the event handling will be. INTERRUPT not be selected.

4.2.2 Data Base Elements

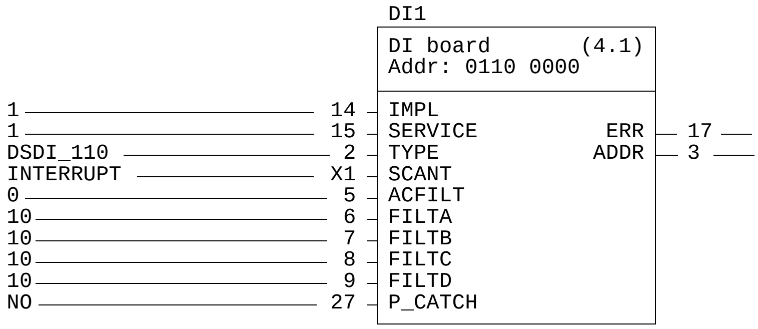
4.2.2.1 DI board

DI board DI

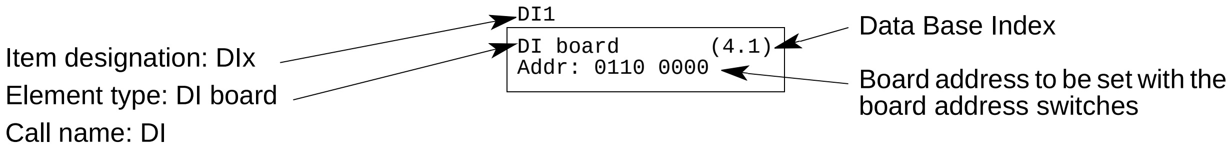
Summary

The DI board data base element holds the data values of the terminals associated to a standard digital input board. The element is superior to the signal elements associated to the digital input channels in the board.

Overview



Head



Item designation: DIx
Element type: DI board
Call name: DI

Data Base Index

Board address to be set with the board address switches

Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
14	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–

Terminal Description (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
15	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/ shows whether the board is in service or has been taken out of service.	–
2	TYPE	user	DSDI_ 110	–	Board **TYPE**: DSDI_110, DSDI_115, DSDI_120, DSDI_125, DSDI_131, and DSDI_141.	TYPE must be selected when creating the element. The full name including ”_” must be entered. TYPE DSDI_110 is valid for DSDI_ 110A and DSDI_120 is valid for DSDI_120A.
X1	SCANT	user	INTER–RUPT	–	**SCANT**ime. See Introduction, ”6. Allowed SCANT-values”.	–
5	ACFILT	user	0	B(r)	**ACFILT**er. ACFILT=1 changes FILTn characteristics: FILTn=0 to 63 implies a filtering time of 0 to 63 ms for signal transition 0 to 1 and of 0 to 127 ms for 1 to 0. The FILTn value range is limited to 0..63 ms in this case. Suitable for AC-signals.	ACFILT=1 requires P_CATH=No.
6	FILTA	user	10	–	**FILT**er time=duration of a signal value change before acceptance. Value range is 0..127 ms. Valid for signal transition 0 to 1 and 1 to 0. Operates on a first group of 8 channels, if TYPE=DSDI_110, DSDI_120, DSDI_131 and DSDI_141.	See also under ACFILT and P_CATCH.
7	FILTB	user	10	–	Same as FILTA but for a second group of 8 channels.	See also under ACFILT and P_CATCH.
8	FILTC	user	10	–	Same as FILTA but for a third group of 8 channels.	See also under ACFILT and P_CATCH.
9	FILTD	user	10	–	Same as FILTA but for a fourth group of 8 channels.	See also under ACFILT and P_CATCH.
27	P_CATCH	user	NO	B(r)	YES changes FILTn characteristics if TYPE=DSDI_110 or DSDI_120: • FILTn=0 to 126 implies a filtering time of 0 to 2530 ms for signal transition 0 to 1 and of 0 to 5060 ms for 1 to 0. • FILTn=127 implies a filtering time of 100 ms for signal transition 0 to 1 and of 2000 ms for 1 to 0.	P_CATCH=YES requires ACFILT=0.
17	ERR	system	–	B(r)	**ERR**or flag indicating non-functional board. 1=hardware or configuration error.	–

Terminal Description (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

4.2.2.2 DX unit

Implementation in Advant Controller 400 Series of digital signals physically connected to a remote I/O unit is carried out with a data base element DX unit. Different circuit boards are available.

There are board types for digital inputs only and board types combining a number of digital inputs and a number of digital outputs. The element DX unit supports both analog inputs and outputs.

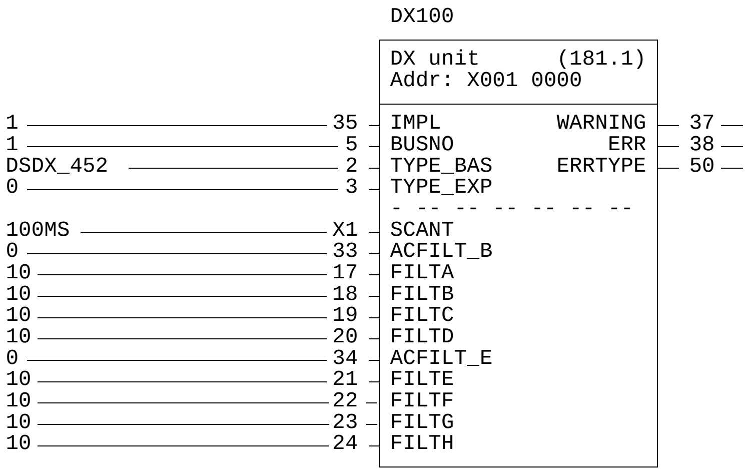
DX unit DX

Summary

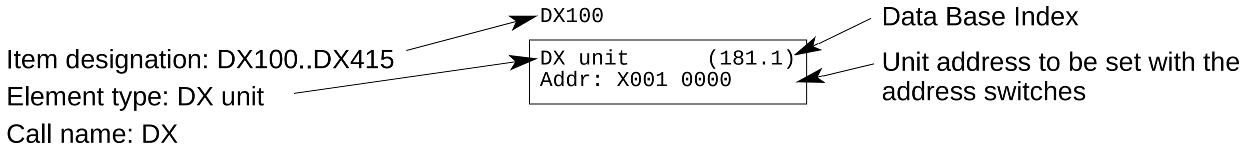
The DX unit data base element holds the data needed to define a digital S400 I/O unit connected to MasterFieldbus.

The element is superior to the Digital Input and Digital Output data base elements for the signals of the unit.

Overview



Head



Item designation: DX100..DX415
Element type: DX unit
Call name: DX

Data Base Index

Unit address to be set with the address switches

Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
35	IMPL	user	1	B(r)	**IMPL**emented. 0=The element is spare. 1=The unit is implemented.	–
5	BUSNO	user	*	I(r)	The **N**umber of the **BUS** to which the unit is connected.	–
2	TYPE_BAS	user	DSDX_452	–	Board **TYPE** of **BAS**ic unit: DSDX_452 or DSDI_452, DSDX_454 or DSDI_454.	TYPE DSDX_452 is valid for DSDX_452L and DSDX_454 for DSDX_454L.
3	TYPE_EXP	user	0	–	Board **TYPE** for **EXP**ansion unit: DSDI_451, DSDX_451, DSDI_453, DSDX_453 or 0 (none).	TYPE DSDX_451 is valid for DSDX_451L and DSDX_453 for DSDX_453L.
X1	SCANT	user	100MS	–	**SCAN T**ime interval of input signals: See Introduction, ”Allowed SCANT values”.	–
33	ACFILT_B	user	0	–	1=**FILT**er time is doubled for signal transition to 0. Suitable for **AC** signals. For Base unit inputs (1-32).	–
17	FILTA	user	10	–	**FILT**er time (0..63 ms) for first group of input channels, 1-8.	–
18	FILTB	user	10	–	Same as for FILTA for input channels 9-16.	–
19	FILTC	user	10	–	Same as for FILTA for input channels 17-24	–
20	FILTD	user	10	–	Same as for FILTA for input channels 25-32.	–
34	ACFILT_E	user	0	–	1=**FILT**er time is doubled for signal transition to 0. Suitable for **AC** signals. For **E**xpansion inputs (33-64).	–
21	FILTE	user	10	–	**FILT**er time for input channels 33-40.	–

Terminal Description (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
22	FILTF	user	10	–	Same as for FILTA for input channels 41-48.	–
23	FILTG	user	10	–	Same as for FILTA for input channels 49-56.	–
24	FILTH	user	10	–	Same as for FILTA for input channels 57-64.	–
37	WARNING	system	–	B(r)	**WARNING**. Fault , causing stopped execution.	–
38	ERR	system	–	B(r)	**ERR**or flag indicating error stopping execution.	–
50	ERRTYPE	system	–	I(r/w)	**ERR**or **TYPE**.	See the table for Error Types.

Error Types

Flag E or W indicates whether the element outputs ERR or WARNING are set.

Flag E or W indicates whether the element outputs ERR or WARNING are set.

Flag	ERRTYPE	Error
	Not initiated	Illegal BUSNO, IMPL=0 at system init or system not started.
E	Bus controller error	Bus controller board (CI570) is faulty or missing.
E	Communication error	Communication faulty, no reply from unit.
E	TYPE_BAS mismatch	The unit type does not agree with TYPE_BAS.
E	Other error	May be set temporarily during restart.
W	TYPE_EXP fail	Unit type of expansion unit does not agree with TYPE_EXP.
W	Transducer power	Transducer power of base unit fails (fuse?).
	Error Channel A	Error on redundant channel A (modem, cable?)
	Error Channel B	Error on redundant channel B (modem, cable?)
	OK	No error.

The most significant error (uppermost text in table) is given if multiple error occurs.

BUSNO - Bus number

With this terminal you select the number of the bus that the DX unit is to be connected to.

The lowest bus number with less than 16 units is given as the default BUSNO value.

BUSNO can be changed if the system is in configuration mode.

BUSNO is included as the first digit in the Item designation. The full unit address to be set on the S400 I/O unit is shown in the element head.

Item designation: DXabb a=bus

Address in binary: xaaa bbbb b=node on bus
x=hi speed/low speed

Example:

Item designation: DX307

BUSNO: 3

Node on bus: 7

Unit address: x011 0111

Function

More information is to be found in the manual *S400 I/O User's Guide*.

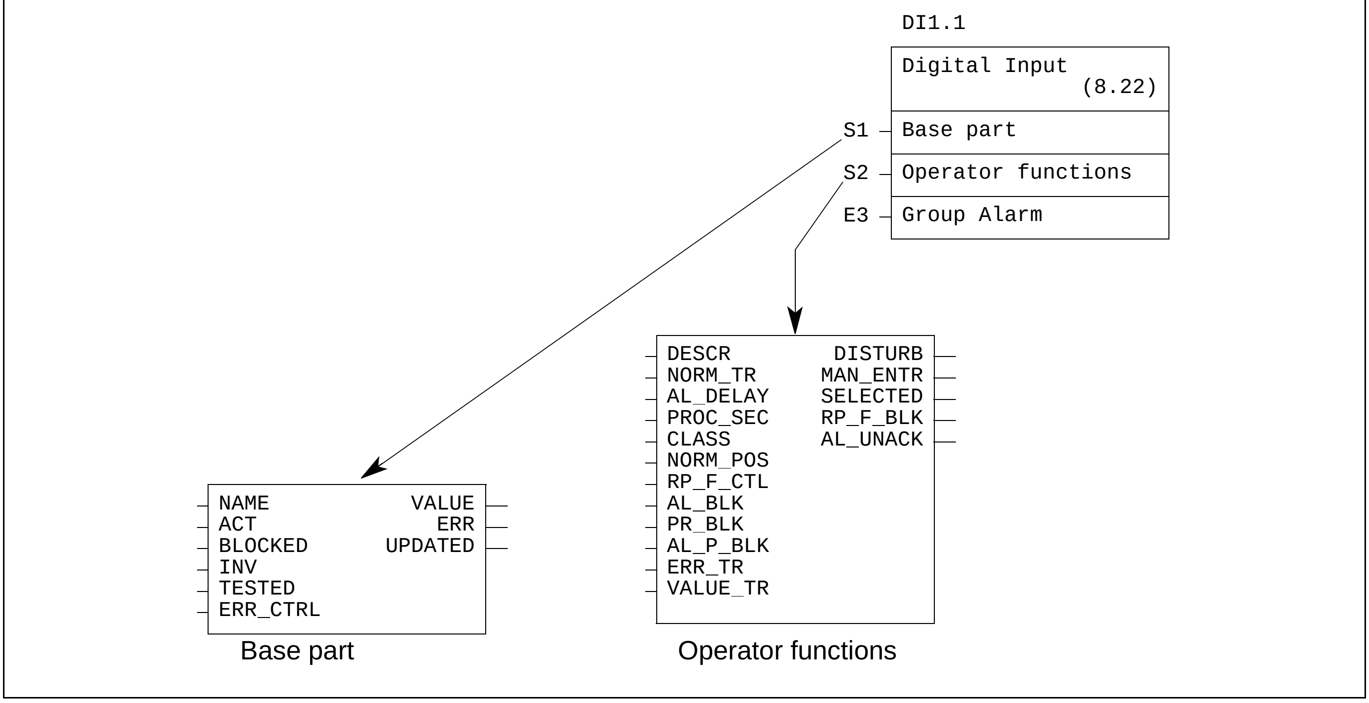
4.2.2.3 DI channel

Digital Input DIS, DIXS

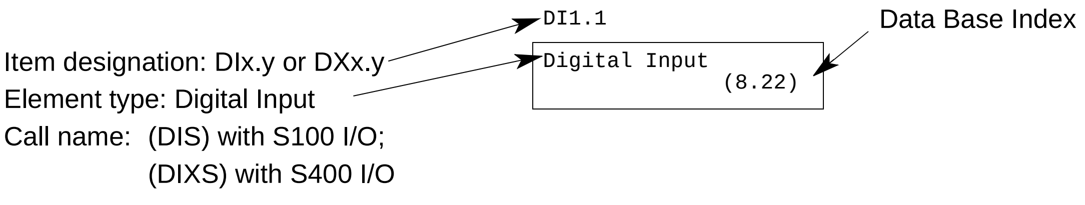
Summary

The Digital Input data base element holds the data values of the terminals associated to a standard digital input channel. The element is subordinate to the DI board or the DX unit data base element. For information about the extension part of Group Alarm see data base element Group Member.

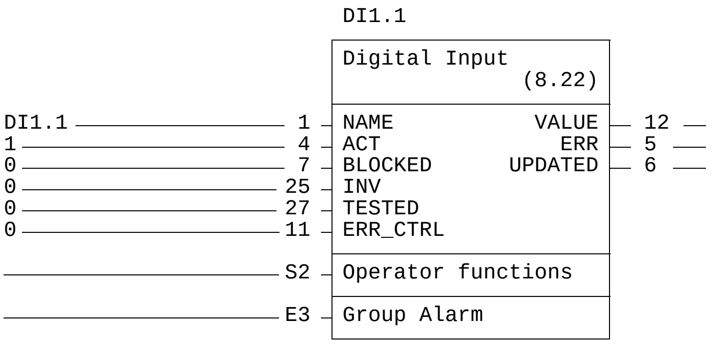
Overview



Head


DI1.1
Digital Input
(8.22)
Data Base Index
Item designation: DIx.y or DXx.y
Element type: Digital Input
Call name: (DIS) with S100 I/O;
(DIXS) with S400 I/O

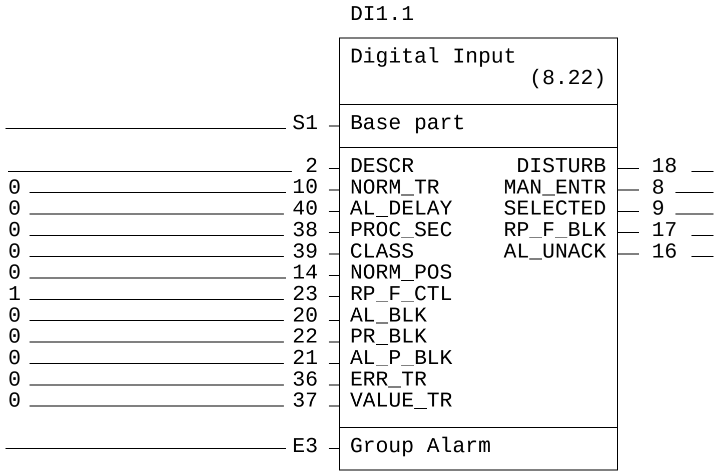
Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DIx.y *or* DXx.y	–	Each Digital Input signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
4	ACT	user	1	B(r)	1=the signal is **ACT**ive. 0=the signal is spare.	–
7	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
25	INV	user	0	B(r/w)	1=the signal value is **INV**erted.	–
27	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
11	ERR_CTRL	user	0	B(r)	**ERR**or **C**on**TR**o**L**. 0=Value is frozen when error occurs. 1=Value is set to the inverted value of NORM_POS when error occurs.	–
12	VALUE	system	–	B(r/w)	Signal **VALUE**.	–
5	ERR	system	–	B(r/w)	1=hardware or configuration **ERR**or.	–
6	UPDATED	system	–	B(r/w)	1=system indicates that VALUE has been **UPDATED**.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
10	NORM_TR	user	0	B(r)	1=**NORM**al event driven updating on displays and lists in Operator Station.	0=no event driven updating in Operator Station.
40	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds	0 = no delay.
38	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
39	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list func. in Operator Station	–
14	NORM_POS	user	0	B(r/w)	**NORM**al **POS**ition. Normal signal value.	Used for alarm and DISTURBance calculation purposes.
23	RP_F_CTL	user	1	B(r)	**R**e**P**eat **F**ail **C**on**T**ro**L**. Request for reduced number of reports of repetetive alarms.	–

Terminal Description, Operator functions (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
20	AL_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
22	PR_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of event **PR**intout in Operator Station.	–
21	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC program.	–
36	ERR_TR	user	0	–	**ERR**or **TR**eatment. Pointer to data base element EVENT_TREAT which defines the event handling in Operator Station of signal errors.	Recommended settings: 0=No event reporting 2=Event reporting incl. alarm handling.
37	VALUE_TR	user	0	–	**VALUE TR**eatment. Pointer to data base element in EVENT_TREAT which defines the event handling in Operator Station of signal value changes.	Recommended settings: 0=No event reporting 1=Event reporting, no alarm handling. 2=Event reporting incl. alarm handling.
18	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indicating whether a state of alarm exists in element.	–
8	MAN_ENTR	system	–	B(r/w)	1=Flag indicating that the signal value has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	–
9	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–
17	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**ail **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
16	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–

4.3 Calculated Digital Input, DIC

The purpose of the DI Calculated element is to supply Operator Station functions - similar to those for a digital process input - to any digital signal used by a PC-program.

A typical application sometimes calls for event handling such as alarm and event printouts in connection with internal digital signal status. DIC is the suitable tool to achieve this function.

4.3.1 Function

DI Calculated DIC

Function

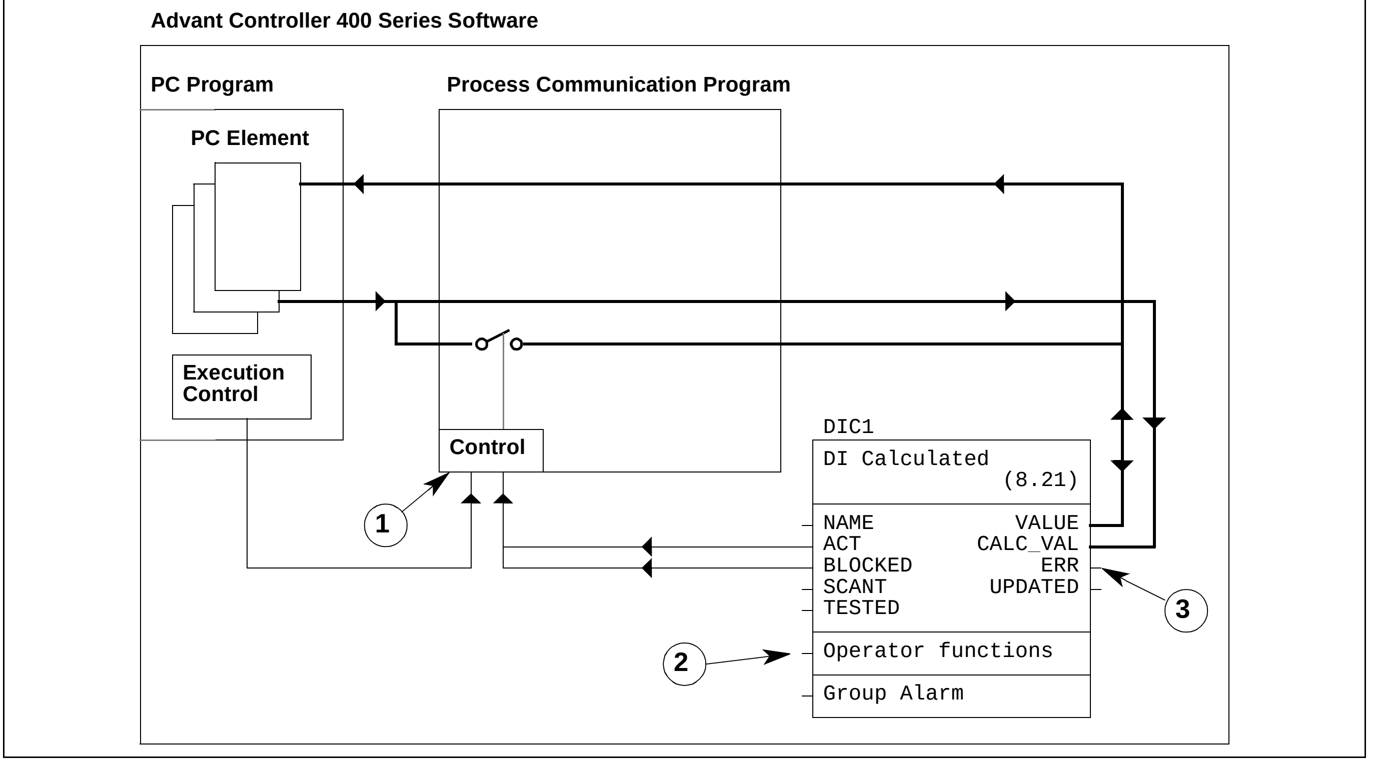
The DI Calculated data base element defines an digital input so that the process communication program can treat calculated signals as if they came from the process. For example, the PC program may calculate a signal from several process signals using a logical expression formed by PC elements, and present it in a DI Calculated data base element so that it looks to the Advant Station 500 Series Operator Station as if it was a true input.

The signal processing controlled by the element includes:

1. Updating
2. Operator Station functions
3. Error handling

The figure below illustrates this signal handling.

Function of DI Calculated Terminals



1. Updating

PC programs and commands writes to the terminal CALC VAL. If BLOCKED=0 full signal treatment is done including updating of VALUE.

If you set BLOCKED, the data acquisition stops, allowing manual entry of VALUE.

To disable the data acquisition completely, you set ACT=0. This excludes the element from processing.

2. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation.

3. Error handling

The ERR terminal is set for internal errors only.

4.3.2 Data Base Elements

4.3.2.1 DIC channel

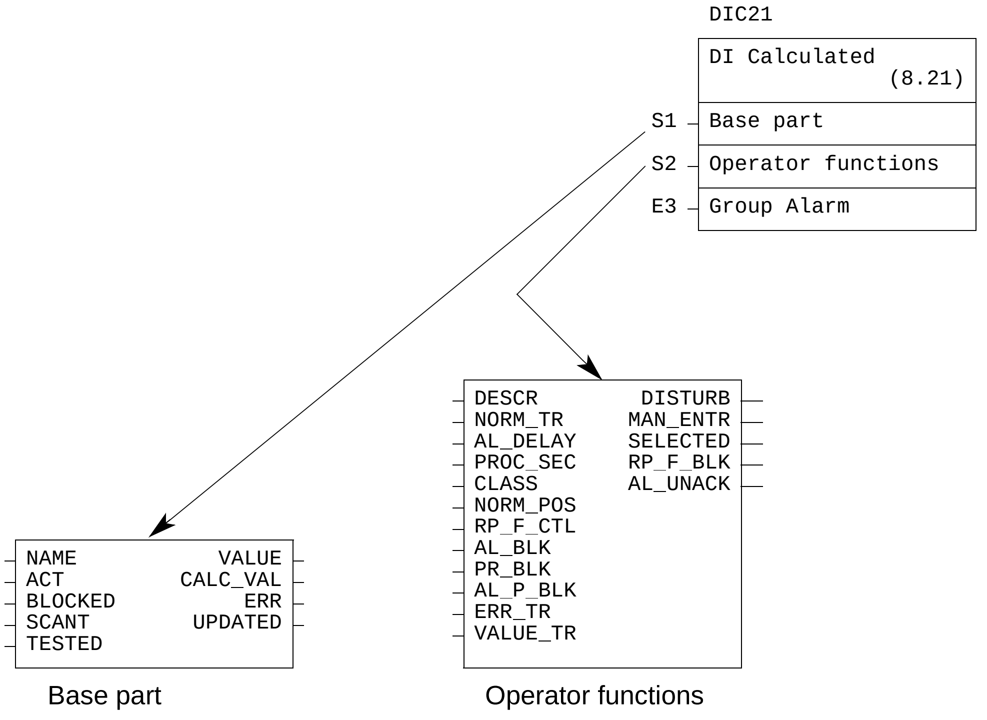
DI Calculated DIC

Summary

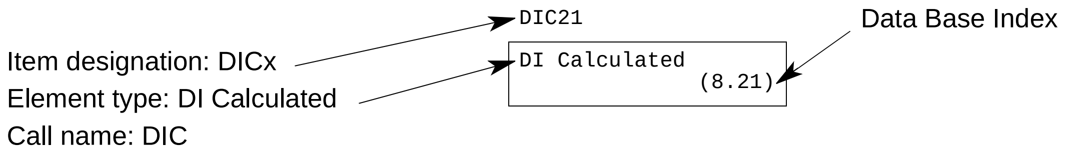
The data values of the DI Calculated data base element defines an internal digital input signal so that the process communication program can treat your calculated signals as if they came from the process. For information about the extension parts of Group Alarm see data base element Group Member.

The main purpose is to supply an interface to Operator functions for signals that do not correspond to physical signals, but have been calculated by the system, usually by PC programs.

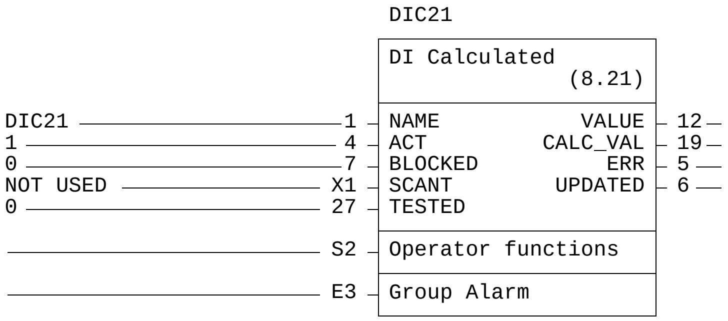
Overview



Head



Base part



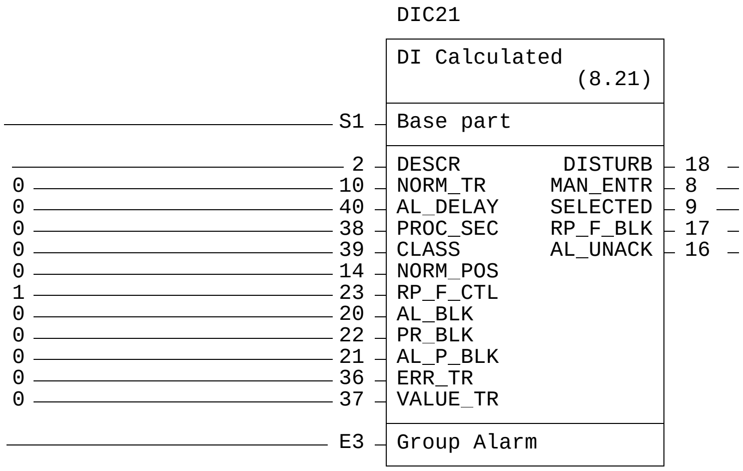
Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DICx	–	Each DI Calculated signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
4	ACT	user	1	B(r)	1=the signal is **ACT**ive. 0=the signal is spare.	–
7	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
X1	SCANT	user	NOT USED	–	Not used. **SCAN T**ime determined by PC program connected to CALC_VAL.	–
27	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
12	VALUE	system	–	R(r/w)	Signal **VALUE**.	–
19	CALC_VAL	system	–	R(r/w)	Input connection for the **CALC**ulated **VAL**ue from PC-program.	–
5	ERR	system	–	B(r/w)	1=Configuration **ERR**or.	Can only be reset by correcting the error.

Terminal Description, Base part (Continued) (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
6	UPDATED	system	–	B(r/w)	1=Value has been **UPDATED** since start-up.	Cannot be affected by user.

Operator functions



Terminal Description, Operator functions

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
10	NORM_TR	user	0	B(r)	**NORM**al event **TR**eatment in Operator Station.	0=no event driven updating in Operator Station.
40	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds.	0 = no delay.
38	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.

Terminal Description, Operator functions (Continued)

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
39	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
14	NORM_POS	user	0	B(r/w)	Normal signal value.	Used for alarm and DISTURBance calculation purposes.
23	RP_F_CTL	user	1	B(r)	Request for reduced number of reports on repetitive alarm in Operator Station.	–
20	AL_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–
22	PR_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of event **PR**intout in Operator Station by PC program.	–
21	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC program.	–
36	ERR_TR	user	0	–	**ERR**or **TR**eatment. Pointer to data base element EVENT_TREAT in Operator Station which defines the event handling of signal errors and operator commands.	Recommended settings: 0=No event reporting 2=Event reporting incl. alarm handling.
37	VALUE_TR	user	0	–	**VALUE TR**eatment. Pointer to data base element in EVENT_TREAT in Operator Station which defines the event handling of signal value.	Recommended settings: 0=No event reporting 1=Event reporting, no alarm handling. 2=Event reporting incl. alarm handling.
18	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indicating whether a state of alarm exists in element.	Cannot be affected by user.
8	MAN_ENTR	system	–	B(r/w)	1=Flag indicating that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	Cannot be affected by user.
9	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–
17	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**lag **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
16	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exists in the element.	–

4.4 Digital Input Event, DIEV

The main function of Digital Input Event (DIEV) is to provide for receival of time tagged events from externally connected controllers, e.g. Advant Controller 110. Receiving of events is configured by means of Event Set (EVS). Analog events (AIEV) and Digital events (DIEV) can be mixed in the same Event Set.

4.4.1 Function

DI Event DIEV

Function

The purpose of the DI Event data base element is to provide for reception of events generated by a DI object in an external Controller (e.g. Advant Controller 110). The Operator functions treats the DIEV signal as an ordinary input signal.

The following signal processing is **NOT** performed by the DI Event data base element:

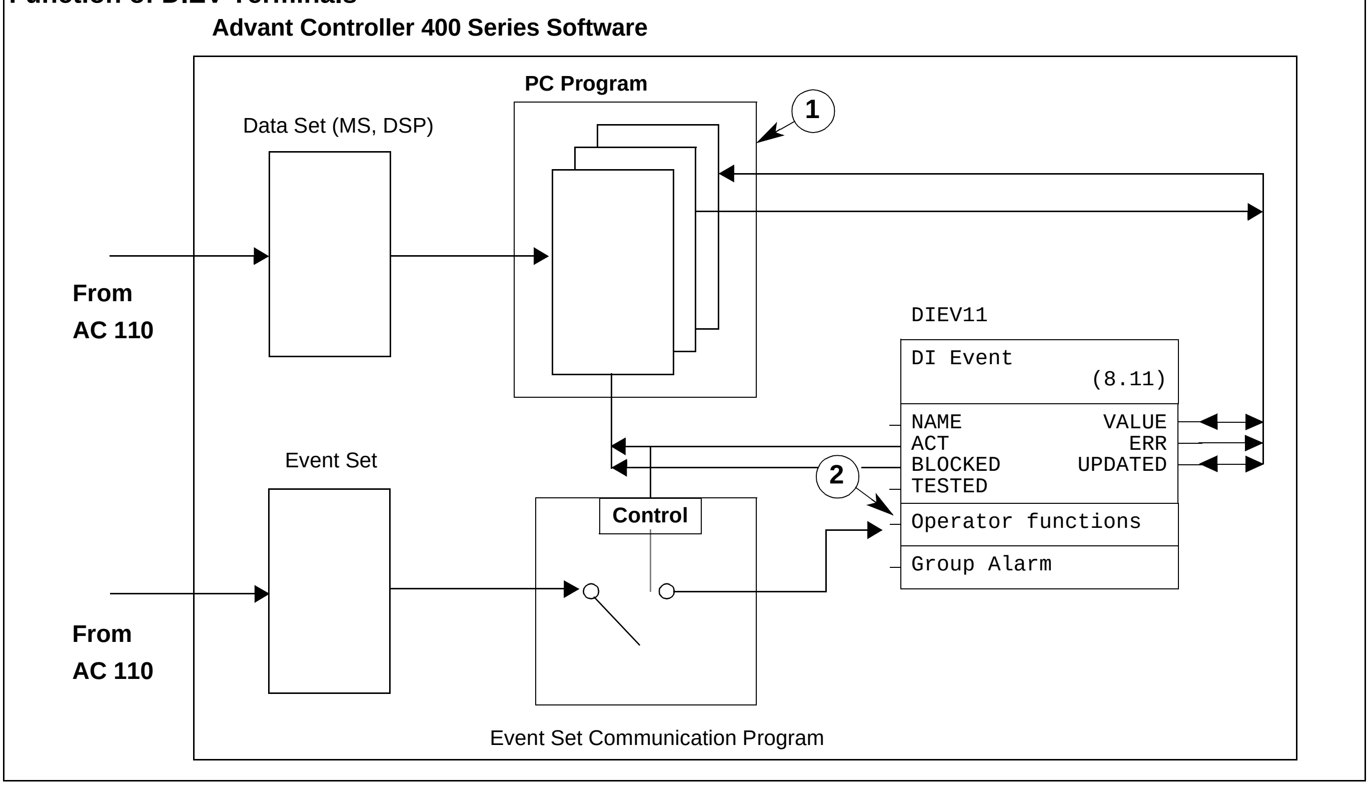
1. Updating

Signal processing performed by the element is:

2. Event handling

The figure below illustrates this signal handling.

Function of DIEV Terminals



1. Updating

The VALUE terminal is not updated by the system when receiving external events. It is however possible to make the DI Event behave more or less as a complete DI object with some application programming. The application must use the Data Set Peripheral communication to cyclically receive the value from the corresponding DI Calculated or Digital Input data base element in the Advant Controller 110, and then update the VALUE terminal of the DI Event element.

Terminals to be handled by an application program when making DI Event a more complete DI object

The VALUE terminal is included but are not handled by the system. It provides for a possible update by the application program, by means of cyclic Data Set transfer and a PC application update. The update of the VALUE terminal does not generate an event to the Advant Station 500 Series Operator Station. The events are supposed to come from the external controller via the Event Set communication to which this element is supposed to be connected.

The UPDATED terminal is only reset to 0 at system start up and is after this not handled by the system. The application program is supposed to handle the update of this terminal when updating the VALUE terminal.

It is the application program responsibility to act according to what is specified on the BLOCKED terminal when updating the VALUE terminal. This is not taken care of by the system.

The ACT terminal controls the flow of time tagged events. It does not prevent the PC application program from updating the VALUE of the element, this must be controlled by the PC program itself.

The ERR terminal can be used by the PC application program to indicate erroneous values or other fatal errors.

2. Event handling

As explained above the events are supposed to be generated by an external controller and received by object, if it is connected to the Event Set communication (see Event Set (Receive)). The event handling is an Operator function.

Note that all events are lost (not sent to the Operator Station) when the BLOCKED terminal is set to 1.

To disable the flow of time tagged events completely, you set ACT = 0. This excludes the element from event processing.

4.4.2 Data Base Elements

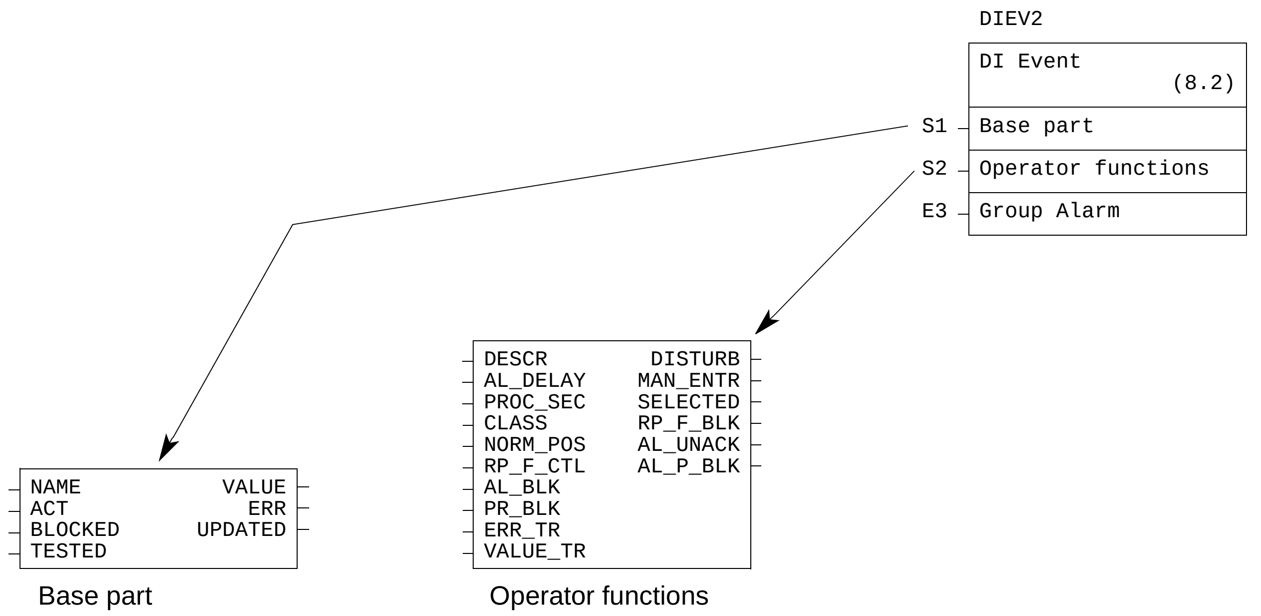
DI Event DIEV

Summary

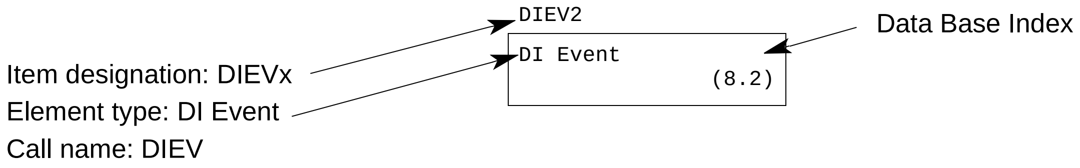
The DI Event data base element main function is to provide for reception of time tagged events from externally connected controllers, e.g. Advant Controller 110. The process value terminal is not updated by the event set handler. It means that the event and alarm handling is the primary function for the functional unit variant DIEV.

The DI Event can be treated as an ordinary digital input, if the PC application program is built to cyclically receive the externally measured or calculated value. Receiving of the value can be programmed by means of data set communication. Depending on selected communication type (RCOM or Advant Fieldbus 100) between the Advant Controller 400 Series and Advant Controller 110, MS (MVI Data Set communication) or DSP (Data Set Peripheral) can be selected for the data set transfer.

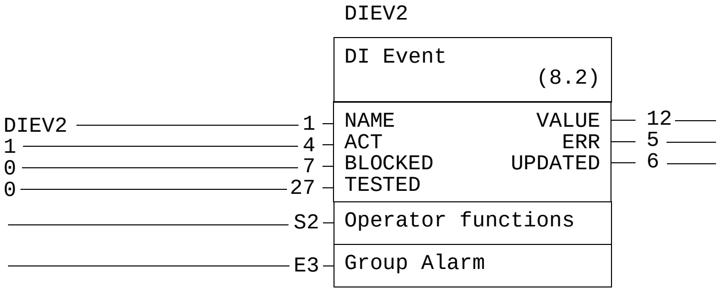
Overview



Head



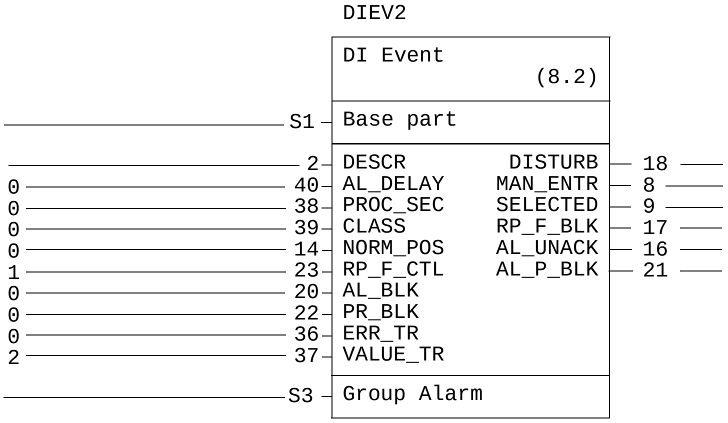
Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DIEVx	–	Unique **NAME** of the DI Event signal.	Max. 20 characters.
4	ACT	user	1	B(r)	0=the signal is spare 1=the signal is **ACT**ive	–
7	BLOCKED	dialog	0	B(r/w)	1=updating of signal value is **BLOCKED**.	–
27	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
12	VALUE	PC	0	B(r/w)	Signal **VALUE**.	–
5	ERR	system	–	B(r/w)	1=Configuration **ERR**or.	Can only be reset by correcting the error.
6	UPDATED	PC	0	B(r/w)	1=Value has been **UPDATED** since start-up.	–

Operator functions



Terminal Description, Operator functions

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters. You may enter any information regarding the signal.
40	AL_DELAY	user	0	I(r/w)	**AL**arm **DELAY** shows delay in seconds.	Not used.
38	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the alarm handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists -1=the signal can not be selected and can not be presented in lists.
39	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
14	NORM_POS	user	0	B(r/w)	**NORM**al signal value.	Used for alarm and DISTURBance calculation purposes.
23	RP_F_CTL	user	1	B(r)	**R**e**P**eat **F**ail **C**on**T**ro**L**. Request for reduced number of reports on repetative alarm in Operator Station.	–
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Max. 20 characters. You may enter any information regarding the signal.
20	AL_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of **AL**arm indication and event handling in Operator Station.	–

Terminal Description, Operator functions (Continued)

Termi-nal No	**Terminal Name**	**Value entered by**	**Default value**	**PC con-nection data type**	**Description**	**Remarks**
22	PR_BLK	dialog	0	B(r/w)	1=**BL**oc**K**ing of event **PR**intout in Operator Station by PC program.	–
36	ERR_TR	user	0	–	**ERR**or **TR**eatment. Pointer to data base element in EVENT_TREAT in the Operator Station which defines the event handlingof signal errors and operator commands.	Recommended settings: 0=no event reporting 2=event reporting including alarm handling.
37	VALUE_TR	user	1	–	**VALUE TR**eatment. Pointer to data base element EVENT_TREAT in the Operator Station which defines the event handling of received events.	Recommended settings: 1=Event handling, no alarm handling 2=Event handling including alarm handling.
18	DISTURB	system	–	B(r/w)	**DISTURB**ance. Flag indicating whether a state of alarm exists in the element.	Can not be affected by user.
8	MAN_ENTR	system	–	B(r/w)	1=Flag indicating that the signal VALUE has been **MAN**ually **ENT**e**R**ed by the Operator Station operator.	Cannot be affected by user.
9	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–
17	RP_F_BLK	system	–	B(r/w)	**R**e**P**eat **F**ail **BL**oc**K**. Flag indicating that a repeating alarm is present in the element but that the indication has been blocked.	–
16	AL_UNACK	system	–	B(r/w)	Flag indicating whether an **UNACK**nowledged **AL**arm exsists in the element.	–
21	AL_P_BLK	PC	0	B(r/w)	**AL**arm **P**eriod **BL**oc**K**. Flag for temporary blocking of alarm indication and event handling in Operator Station by PC program.	–

4.5 Operator Station Functions

The operator station function is divided in principle into four parts:

- Presentation. Display elements, Time logged properties
- Dialog
- Event handling
- Group Alarm

4.5.1 Presentation

Display elements which can be used for different display types are available for used in the functional unit Digital Input.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display.

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual.*

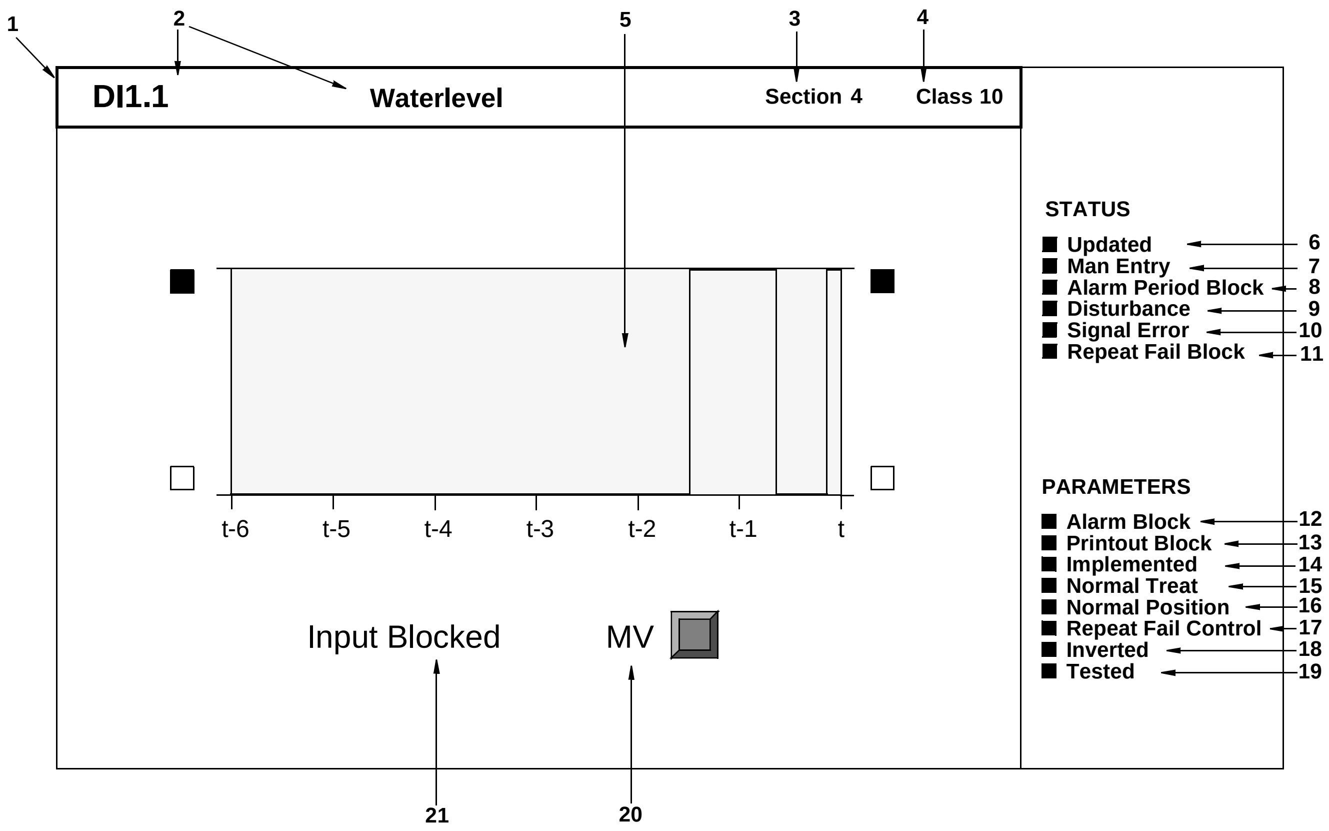
Detailed information of alternative way of presentation of certain status and data within the displays such as color, flashing, blocked etc. is given in the referenced manual.

Time-logged Properties

Measured values stored can be presented graphically in the form of curves on the display screen. Such a display, a **trend display**, can consist of 1-4 curves.

For the functional unit Digital Input the signal value can be logged and presented. The logged property is designated MV.

Object display: DIOB01



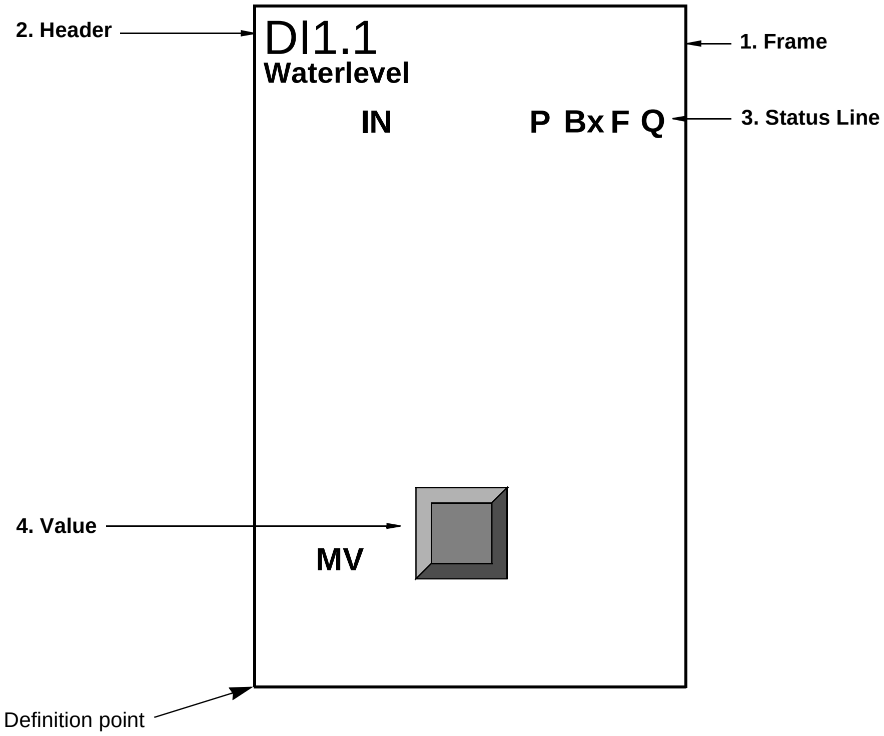
No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3.1	Section Text	
3.2	Section Value	Process section
4.1	Class Text	
4.2	Class Value	Object class
5.1	Value Trim Curve	
5.2	Range Indicators	
6	STATUS	
6.1	Updated Indication	
6.2	Updated text	
7.1	Manual entry Indication	
7.2	Manual entry text	
8.1	Alarm period block Indication	
8.2	Alarm period block text	
9.1	Disturbance Indication	Fault

No	Description	Remarks
9.2	Disturbance text	
10.1	Signal error Indication	I/O Error
10.2	Signal error text	
11.1	Repeat fail block Indication	
11.2	Repeat fail block text	
12	PARAMETERS	
12.1	Alarm block Indication	
12.2	Alarm block text	
13.1	Printout Indication	
13.2	Printout text	
14.1	Implemented Indication	
14.2	Implemented Text	
15.1	Normal treat Indication	
15.2	Normal treat Text	
16.1	Normal position Indication	
16.2	Normal position Text	

No	Description	Remarks
17.1	Repeat Fail Control Indication	
17.2	Repeat Fail Control Text	
18.1	Inverted Indication	
18.2	Inverted Text	
19.1	Tested Indication	

No	Description	Remarks
19.2	Tested Text	
20.1	MV Text	
20.2	Value	
21	Input Blocked	

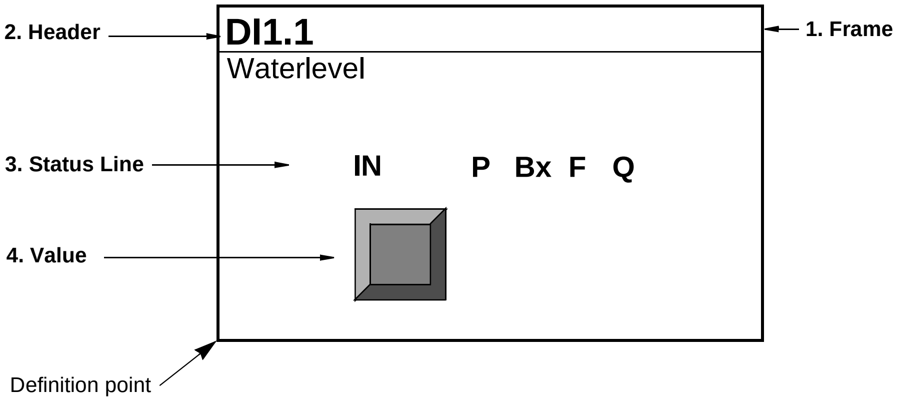
Display Element for Group display: DIGR01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Input blocked	
3.2	Printout blocked	

No	Description	Remarks
3.3	Alarm Blocked	
3.4	Alarm Indication	
3.5	Error Indication	I/O Error
4.1	MV Text	
4.2	Value	

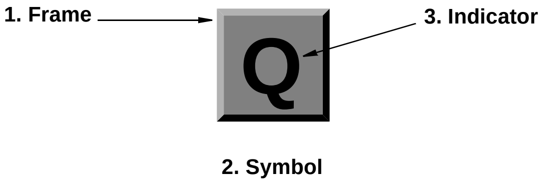
Display Element for Object closeup display: DIOWI01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Input blocked	
3.2	Printout blocked	

No	Description	Remarks
3.3	Alarm blocked	
3.4	Alarm Indication	
3.5	Error Indication	I/O Error
4.1	MV Text	
4.2	Value	

Display Element for Process display: DIPD01



No	Description	Remarks
1	SelectFrame	
2	Symbol CenterColor	
3	Indicator	

No	Description	Remarks
3.1	Quality	
3.2	Label	User defined character

4.5.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.

The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit Digital Input has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog but no subdialogs. The MAX dialog consists of an output dialog with 1 subdialog.

MIN dialog (No authority key)

Keyboard keys

◇	**On**	Set value to one
▽	**Off**	Set value to zero
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display

Dynamic keys, Keyboard

D1 ■ On	D2	D3	D4	D5
D6 □ Off	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

On	Set value to one
Off	Set value to zero
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

◇	**On**	Set value to one
▽	**Off**	Set value to zero
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1 Block Input	D2 Block Alarm	D3 Block Printout	D4	D5
D6 Deblock Input	D7 Deblock Alarm	D8 Deblock Printout	D9 Alarm Delay	D10 *Keyboard...*

Block Input	Block data base input
Block Alarm	Block alarm indication and event handling from signal
Block Printout	Block event printout from signal
Deblock Input	Deblock data base input
Deblock Alarm	Deblock alarm indication and event handling from signal
Deblock Printout	Deblock event printout from signal
Alarm Delay	Time to delay alarms
Keyboard...	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard...

D1 ■ On	D2	D3	D4	D5
D6 □ Off	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

On	Set value to one
Off	Set value to zero
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

4.5.3 Event Handling

This section contains a description of all standard alarms and events in the functional unit Digital Input. The description is given under the following headings:

- General
- Event description with standard texts
- Event and alarm blocking.

Event handling as a common property of the Advant OCS system is described in detail in Advant Station 500 Series Operation Station documentation and AdvaCommand documentation. Reference is made for example to the manual *AdvaCommand Basic Functions User's Guide* when there are special requirements of user defined event handling incl. texts.

The event texts for all functional units are also collected in the manual *AdvaCommand User Interface Reference Manual*, giving the user a convenient quick reference library for the application work.

General

The event handling is controlled by some configuration parameters, EVENT-TREAT pointers, in the data base element located in Advant Controller 400 Series and by utilizing a default or a user defined EVENT-TREAT record in Advant Station 500 Series Operator Station. The principle is illustrated in the figure below.

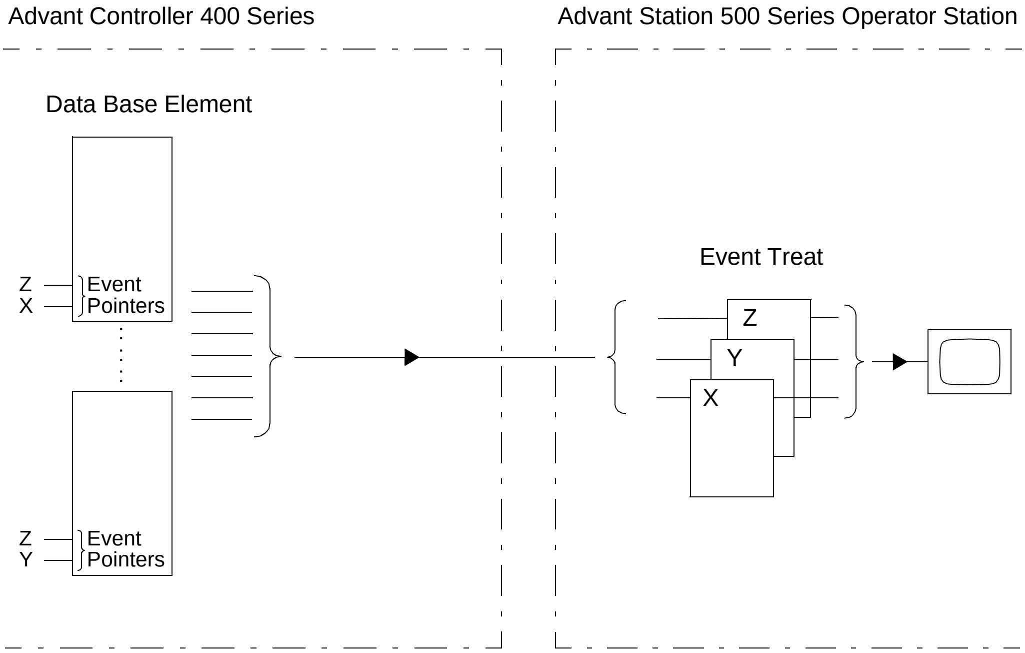

Advant Controller 400 Series
Advant Station 500 Series Operator Station
Data Base Element
Z
X
Event
Pointers
Z
Y
Event
Pointers
Event Treat
Z
Y
X

Figure 4-2. The principle of event handling in Digital Input

The Event Treat defines the event handling in the operator station such as audible alarms, text combinations in event and alarm list, colors, different handling for 0 -->1 and 1 -->0 transitions.

How different events from DI is treated is given in Figure 4-1 below. This also specifies which event handling is obtained as default and which alternative standard functions are available.

Event description with standard texts

Table 4-1. Event Texts for DI

Events	Event Treat pointer	Property text		Event text	
		Standard text	Line No in Event Treat	Standard text	Line No in Event Treat
Abnormal position On	VAL_TR	Value	1	Alarm	1
Normal position On	VAL_TR	Value	1	Normal	2
Signal error On	ERR_TR	Sig.Err	1	Alarm	1
Signal error Off	ERR_TR	Sig.Err	1	Normal	2

Event and Alarm Blocking

The event and alarm blocking is discussed in a general way in the manual *Functional Units Part 1 Common Properties.*

A schematic description of the blocking facilities in the Digital Input is given in Appendix A .

In the dialog for the functional unit Digital Input, the operator can block and deblock the listed event- and alarm handling.

Table 4-2. Event and Alarm Blocking

Dialog Key	Event- and Alarm handling blocked for signals:	Remark
BLK AL	VALUE (in defined abnormal position), ERR	Block alarm
DEBLK AL	VALUE (in defined abnormal position), ERR	Deblock alarm
BLK PRT	VALUE (in defined abnormal position), ERR	Blocks printout on printers only
DEBLK PRT	VALUE (in defined abnormal position), ERR	Deblock printout

4.5.4 Group Alarm

It is possible to connect the functional unit DI to the group alarm function. This function makes it possible to gather alarm and events from related process signals and objects in to Alarm Groups. These groups are then treated as objects.

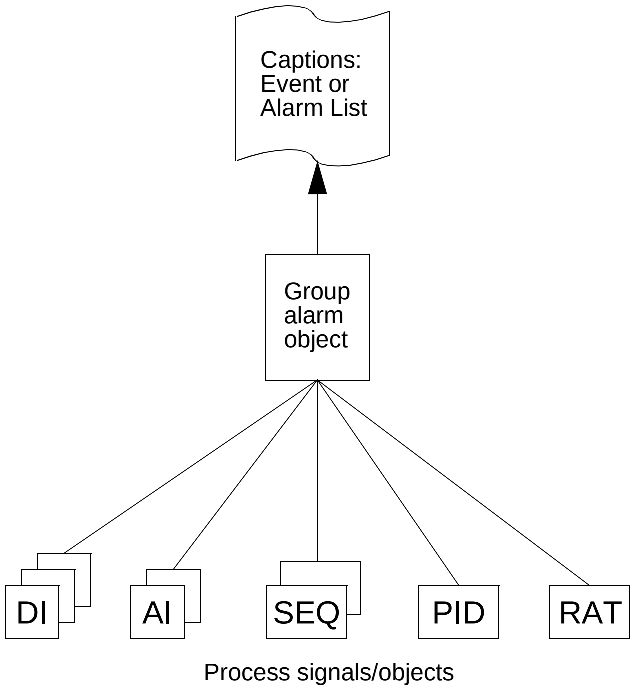


Figure 4-3. Group Alarm

The group alarm function consists of four parts as follows:

- Grouping of process alarms and events with a view to creating pilot alarms and events
- Blocking of groups
- Automatic acknowledgement
- External alarm outputs.

For a more detailed description of the group alarm function, reference is made to the manual *AdvaCommand Basic Functions User’s Guide*.

4.6 Function Diagram

The function diagram in section A.4 in Appendix A describes in detail the relation between all input and output signals in the functional units. Figure A-1 in Appendix A explains the used designations in the circuit diagram.

Chapter 5 Digital Outputs

The functional unit Digital Output is a part of the Advant OCS system. The unit incorporates functions for:

- Output signal storage and updating
- Auto and Manual modes of control
- Inversion of stored data prior to output
- Output of a digital control signal to the process
- Operator station functions.

There is a version of Digital Output for internally calculated "output value" with no connection to hardware.

All these utilities make the unit a powerful tool for implementing process supervision and control. The existence of pre-configured functions, beyond the basic ones for data storage and output, means that the application engineering time, and cost, can be significantly reduced.

5.1 Configuration

5.1.1 General

The functional unit Digital Output consists of a number of hardware and software parts:

- A data base element for storage of the process output signal and various other descriptive properties and control parameters. A data base element may be seen as the outward representation of a data record. The purpose of it is to achieve convenient access to all relevant data at one place only.
- Operator station functions consisting of pre-configured presentation, dialog, event and alarm handling.
- A data base element for storage of parameters describing the output board used and defining its function. The existence of data base elements for output board description facilities easy change of board type and various functional parameters.
- An output channel of a digital output board.

All these parts relate to each other according to the Figure 5-1.

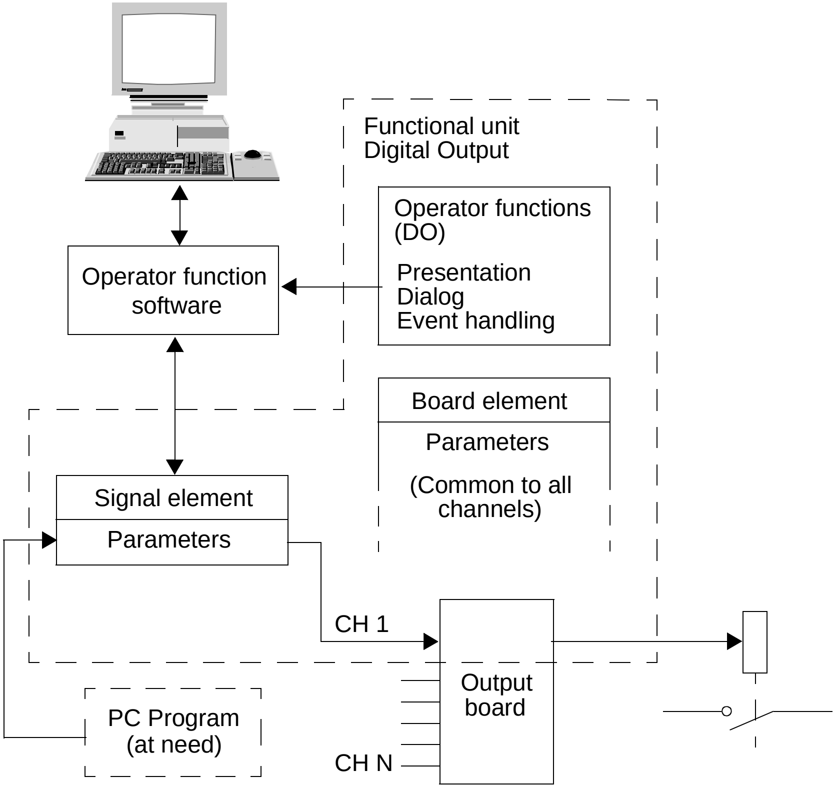


Figure 5-1. The structure of the functional unit Digital Output

5.2 Digital Output, DO

A number of output boards with different technical data such as number of channels, rated output voltage, static or relay output stage etc. are available in the Advant Controller system.

Local or distributed process connection of digital output signals is possible.

Information of the complete range of circuit boards for local process connection is given in the manuals *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide*.

The same information comprising distributed connection is given in *MasterFieldbus and S400 I/O User's Manual*. This document also includes the hardware function of the distributed boards.

5.2.1 Function

DO board DO

Function of the DO board

The output lines to the process are connected in the connection unit. This unit contains overvoltage protection and fuses.

Different board types with different electrical terminals (e.g. different signal levels, different static-or relay outputs) are available. Galvanic isolation is obtained through optocouples or relays.

Yellow LED's indicate the state of the output registers. A red LED indicates board error.

Address selection: The address to be set is given in the element head.

Example: The first digital output card uses hexadecimal address 90=1001 0000 (i.e. address bits 4 and 7 set).

For board data and strappings, please refer to the manuals *Advant Controller 410 User's Guide* and *Advant Controller 450 User's Guide*.

Board set-up procedure

With the data base element you set up the board for the process communication.

The board set-up includes:

1. Implementation
2. Disabling
3. Board type
4. Error handling

1. Implementation

During system INIT the board and its signals are included in the tables that define the PDC (Process Data Communication). If you set IMPL=0 the board, and the channels associated with it, are removed from the PDC's tables.

2. Disabling

At any time, you can use the ”SERVICE” terminal to disable, and later enable the board. This saves some but not all CPU-load. This function will be used if a board must be unplugged during operation. (If Advant Station 500 Series Operator Station is included in your system – see the Advant Station 500 Series Operator Station manuals.

3. Board type selection

Board type	**Value**
DSDO_110	32 ch. for 24-48 V DC, 150 mA
DSDO_115	32 ch. for 24 V DC, 150 mA short circuit protection
DSDO_120	16 ch. for 24-48 V DC, 1 A
DSDO_131	16 ch. for 24-240 V AC/DC (Relay)
DSDO_140	16 ch. for 48-240 V AC/DC (Triac)

Type must be selected when creating the element.

Once created, a board type can be changed if the new board type has the same number of channels as the old one. If not, the data base element and all the subordinated signal elements must be deleted.

4. Error handling

The ERR terminal is set in DO board element, if the board is defined as non-functional by the control function.

The ”ERR” terminal can be connected to the PC program for the desired function.

ERR is reset, if hardware error, within 5 seconds of replacement of the non-functional board.

The error lamp on the board is lit when ERR is set, provided that CPU has access to the board.

Digital Output DOS, DOXS

Function

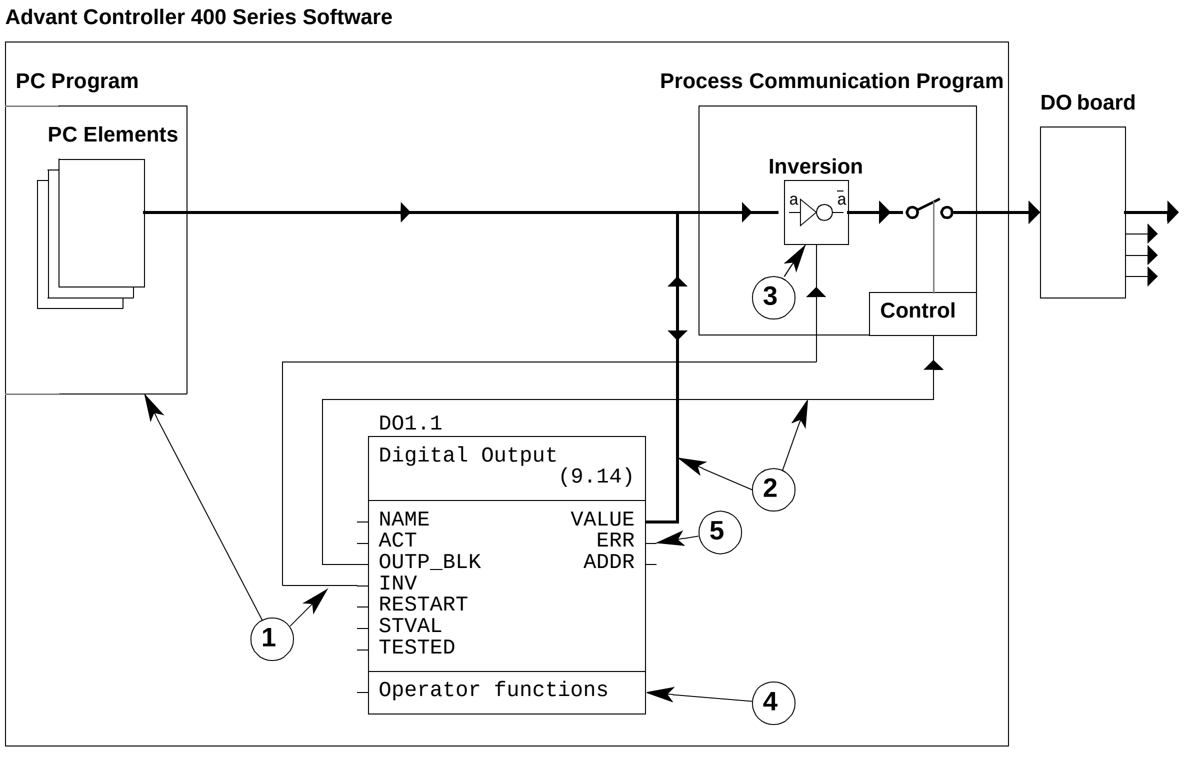
With the data base element you control the signal processing executed by the process communication program. You can also define the interface to the Advant Station 500 Series Operator Station system.

The signal processing includes:

1. Update request
2. Update of data base ”VALUE”
3. Invertion
4. Operator Station functions
5. Error handling

The figure below illustrates this process.

Function of Digital Output Terminals



See Function (notes on S400 I/O) for further information on applications using S400 I/O via ABB MasterFieldbus.

1. Update request

Update is requested by the PC program connected to the output, or by other programs (such as the element) or from the Operator Station terminal.

To disable the signal completely, you set ACTivated to 0.

2. Update of data base ”VALUE”

The signal is stored in ”VALUE”. In the data base element, the signal is available for connection to PC programs and for monitoring.

If you set OUTPut_BLocKed, only ”VALUE” is updated, not the physical output. This enables the program to be run without affecting the process.

3. Invertion

If you set the INVert terminal, the electrical signal is off when VALUE is 1, an it is on when VALUE is 0. This is suitable when the logical actuator function is the inverse of the electrical.

4. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation and Functional Unit documentation.

5. Error handling

The supervision function for an Digital Output indicates errors via the ERR terminal. ERR is set for all signals of a DO board or DX unit element when the S100 or S400 I/O board function is defined as non-functional. Missing or incorrectly strapped hardware are typical errors as are errors in software or data base elements. For DX units it is possible that the error is in the bus communication (ABB MasterFieldbus).

ERR is set in the signal element if the DO board is not implemented.

The LED on the board front shows steady light if ERR is set (provided that the CPU has access to the board). ERR is reset within 10 seconds of replacement of the non-functional hardware unit.

Update of values at system inits

The value to be used at system init is determined by the RESTART connection. The value retained in the VALUE connection since the last execution is used if RESTART = VALUE.

The VALUE connection is updated with the value of STVAL if RESTART = STVAL and the signal is simultaneously put out on hardware.

Function (notes on S400 I/O)

Output of digital signals is handled by a DX unit connected to an Advant Controller 400 Series via MasterFieldbus. A DX unit’s software configuration is determined through a DX unit data base element in Advant Controller 400 Series. Such an element is comparable to a DO board element for a digital output unit located in the Advant Controller 400 Series framework.

All handling of the individual signal, and it’s Digital Input element, is the same regardless of whether S100 or S400 I/O is used. See below for some minor differences.

Communication error function

The values of the RESTART and STVAL parameters are stored in the DX unit and are used to determine the value of the output if it is not updated within 0.2 seconds. This can occur if the communication is broken.

5.2.2 Data Base Elements

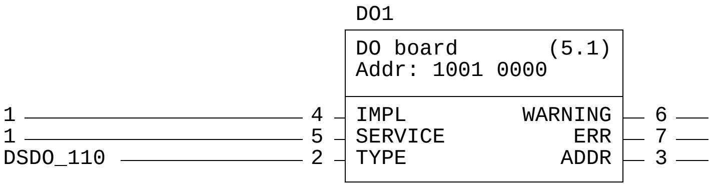
5.2.2.1 DO board

DO board DO

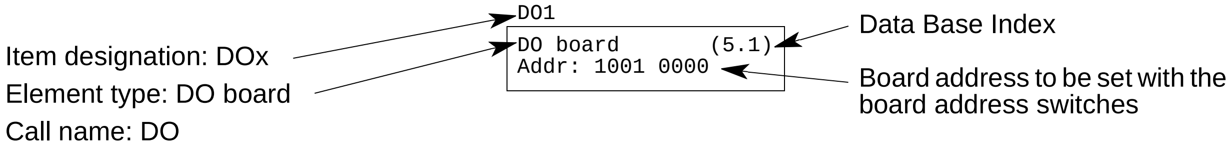
Summary

The DO board data base element holds the data values of the terminals associated to a standard digital output board. The element is superior to the signal elements associated to the digital output channels in the board.

Overview



Head



Terminal Description

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
4	IMPL	user	1	B(r)	0=the board is spare 1=the board is **IMPL**emented	–
5	SERVICE	user, dialog	1	B(r/w)	The in-**SERVICE** terminal controls/shows whether the board is in service or has been taken out of service.	–

Terminal Description (Continued)

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	TYPE	user	DSDO_110	–	Board **TYPE**: DSDO_110, DSDO_115, DSDO_120, DSDO_131, DSDO_140.	TYPE must be selected when creating the element. The full name including "_" must be entered.
6	WARNING	system	–	B(r)	**WARNING** flag indicating system error in an output signal.	Can not be affected by the user.
7	ERR	system	–	B(r)	**ERR**or flag indicating non-functional board.	–
3	ADDR	system	–	–	Board location within the I/O **ADDR**ess range, presented in decimal format.	Cannot be changed.

5.2.2.2 DX unit

Implementation in Advant Controller 400 Series of digital signals physically connected to a remote I/O unit is carried out with a data base element DX unit. Different circuit boards are available.

There are board types for digital inputs only and board types combining a number of digital inputs and a number of digital outputs. The element DX unit supports both analog inputs and outputs.

Please refer to Section 4.2.2.2 DX unit

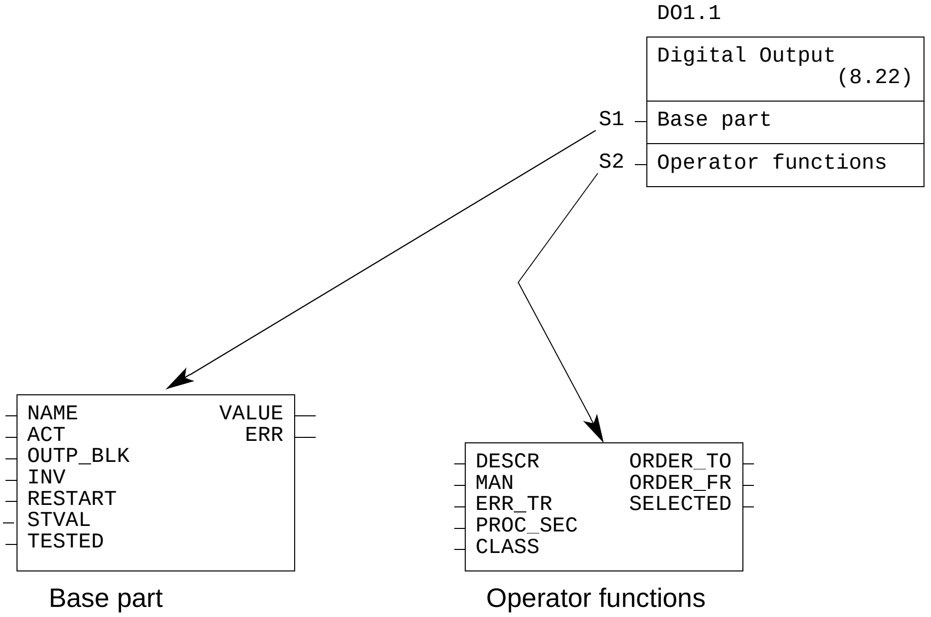
5.2.2.3 DO channel

Digital Output DOS, DOXS

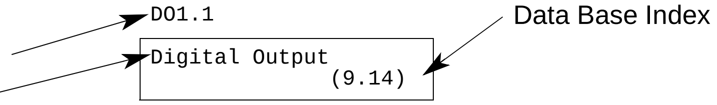
Summary

The Digital Output data base element holds the data values of the terminals associated to a standard digital output channel. The element is subordinate to the DO board data base element (S100 I/O) or the DX unit data base element (S400 I/O).

Overview

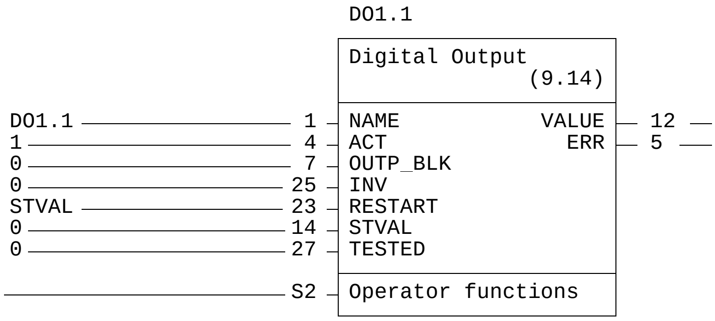


Head



Item designation: DOx.y or DXx.y
Element type: Digital Output
Call name: (DOS) with S100 I/O
(DOXS) with S400 I/O

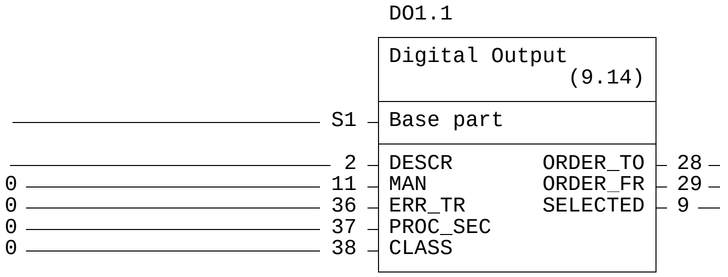
Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DOx.y *or* DXx.y	–	Each Digital Output signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
4	ACT	user	1	B(r/w)	1=the signal is **ACT**ive. 0=the signal is spare.	–
7	OUTP_BLK	user	0	B(r/w)	1=board **OUTP**ut is **BL**oc**K**ed.	VALUE will still be updated.
25	INV	user	0	B(r/w)	1=the signal value is **INV**erted.	–
23	RESTART	user	STVAL	B(r/w)	Selects **RESTART** output value. STVAL=Start value according to STVAL terminal VALUE=Start value equals last value	–
14	STVAL	user	0	B(r/w)	**ST**art **VAL**ue for output.	–
27	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	–
12	VALUE	system	–	R(r/w)	Output signal **VALUE** (before invertion).	–
5	ERR	system	–	B(r/w)	**ERR**or. 1=hardware or configuration error.	–

Operator functions



Terminal Description, Operator functions

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
11	MAN	dialog	0	B(r/w)	Flag indicating that **MAN**ual control by Operator Station operator has been selected.	0=controlled and updated by PC-program.
36	ERR_TR	user	0	–	**ERR**or **TR**eatment.	Not used.
37	PROC_SEC	user	0	I(r/w)	**PROC**ess **SEC**tion is used for sectioning the object handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
38	CLASS	user	0	I(r/w)	**CLASS** subdivides process section. Used by status list function in Operator Station.	–
28	ORDER_TO	system	–	B(r/w)	Flag carrying ”ON”, ”OPEN” etc **ORDER**s from Operator Station system **TO** PC-program.	Can be read and reset by PC program.
29	ORDER_FR	dialog	–	B(r/w)	Flag carrying ”OFF”, ”CLOSE” etc **ORDER**s **FR**om Operator Station system to PC-program.	Can be read and reset by PC program.
9	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

5.3 Calculated Digital Output, DOC

The purpose of the DO Calculated element is to supply Operator Station functions - similar to those for a digital process output - to any digital signal used by a PC-program. DOC is the suitable tool to permit the operator to give commands such as start and stop to application functions in PC program.

5.3.1 Function

DO Calculated DOC

Function

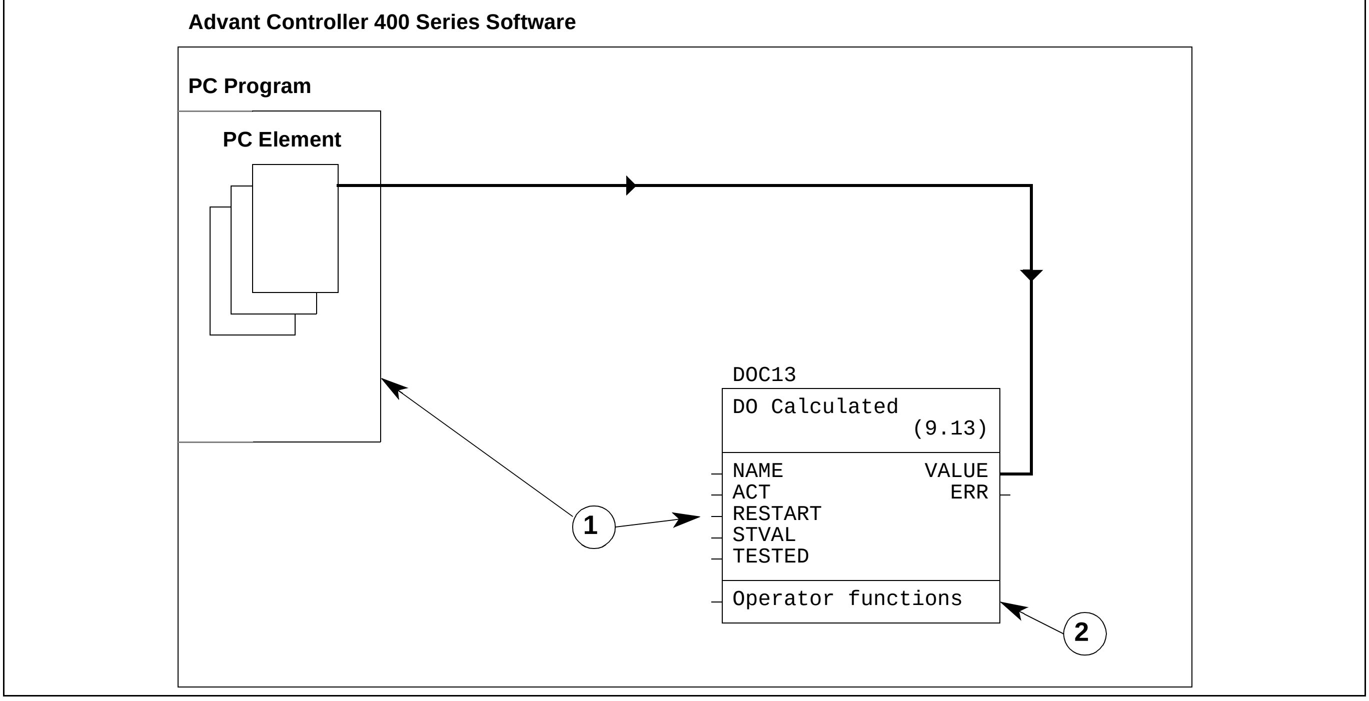
The DO Calculated data base element defines an internal digital output. The value will not be out on hardware but all Operator functions associated to a digital output will be available for the value.

The signal processing includes:

1. Update
2. Operator Station functions

The figure below illustrates this process.

Function of DO Calculated Terminals



1. Update

Update is requested by the PC program connected to the output, the Engineering Stations or from the Operator Station.

To disable the signal completely, you set ACTivated to 0.

The signal is stored in ”VALUE”. The signal is available for connection to programs and for presentation.

2. Operator Station functions

If Advant Station 500 Series Operator Station is included in your system, please refer to the Advant Station 500 Series Operator Station documentation.

Update of values at system inits

The value to be used at system init is determined by the RESTART terminal. The value retained in the VALUE terminal since the last execution is used if RESTART=VALUE.

The VALUE terminal is updated with the value of STVAL if RESTART=STVAL.

5.3.2 Data Base Element

5.3.2.1 DOC channel

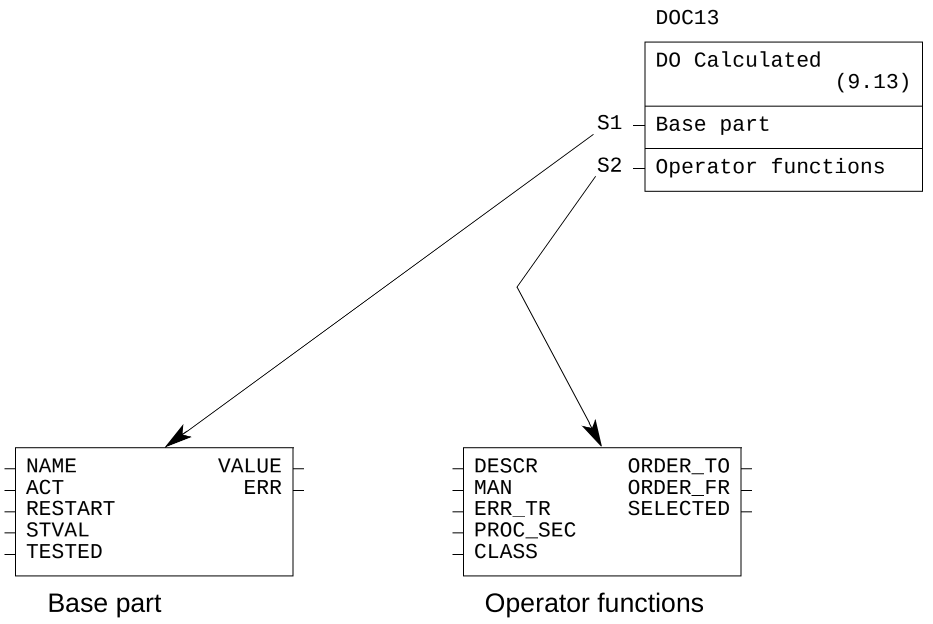
DO Calculated DOC

Summary

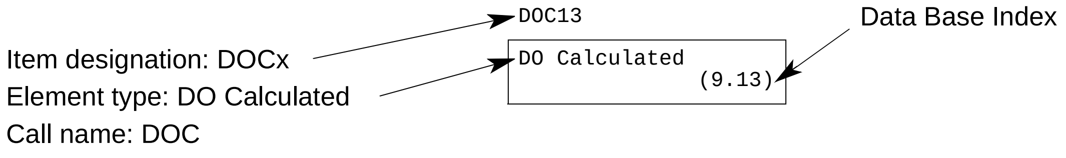
The data values of the DO Calculated data base element is to supply Operator functions – similar to those for a digital output – to any boolean value.

The DO Calculated element holds data for these functions.

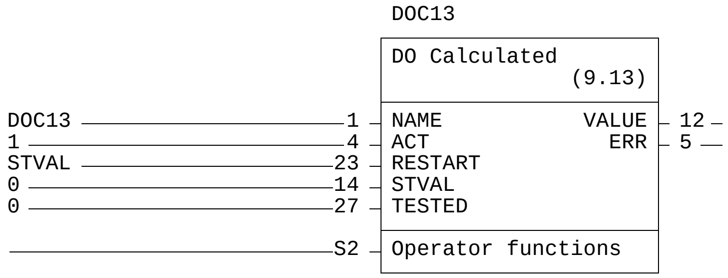
Overview



Head



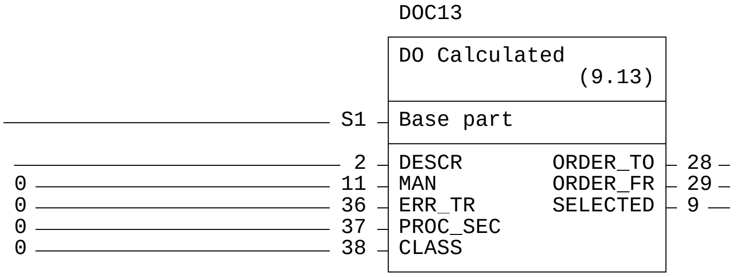
Base part



Terminal Description, Base part

Terminal No	Terminal Name	Value entered by	Default value	PC connection data type	Description	Remarks
1	NAME	user	DOCx	–	Each DO Calculated signal must have a unique **NAME**.	Max. 20 characters. Spaces are not allowed.
4	ACT	user	1	B(r)	1=the signal is **ACT**ive. 0=the signal is spare.	–
23	RESTART	user	STVAL	B(r/w)	**RESTART** selects output value at system restart. STVAL=restart value defined by terminal STVAL VALUE=the last value is selected as restart value	–
14	STVAL	user	0	B(r/w)	**ST**art **VAL**ue for output.	–
27	TESTED	user	0	B(r/w)	Can be set by user to indicate that the signal has been **TESTED** at start-up.	Does not affect the system.
12	VALUE	system	–	R(r/w)	Signal **VALUE**.	–
5	ERR	system	–	B(r/w)	1=Configuration **ERR**or.	ERRor is reset only by correcting the error.

Operator functions



Terminal Description, Operator functions

Termi-nal No	Terminal Name	Value entered by	Default value	PC con-nection data type	Description	Remarks
2	DESCR	user	–	–	This **DESCR**iption of the signal will be used in pictures and lists in Operator Station.	Maximum 20 characters. You may enter any information regarding the signal.
11	MAN	dialog	0	B(r/w)	Flag indicating that **MAN**ual control by Operator Station operator has been selected.	0=controlled and updated by PC-program.
36	ERR_TR	user	–	–	ERRor TReatment.	Not used.
37	PROC_SEC	user	0	I(r/w)	PROCess SECtion is used for sectioning the object handling. Section numbers 1-16.	0=no sectioning. The signal may be presented in lists –1=the signal cannot be selected and cannot be presented in lists.
38	CLASS	user	0	I(r/w)	CLASS subdivides process section. Used by status list function in Operator Station.	–
28	ORDER_TO	system	–	B(r/w)	ORDER TO. Flag carrying ”ON”, ”OPEN” etc orders from Operator Station system to PC program.	Can be read and then reset by PC program.
29	ORDER_FR	system	–	B(r/w)	ORDER FRom. Flag carrying ”OFF”, ”CLOSE” etc orders from Operator Station system to PC program.	Can be read and then reset by PC program.
9	SELECTED	system	–	B(r/w)	Flag indicating whether the element has been **SELECTED** by the Operator Station operator for dialog.	–

5.4 Operator Station Functions

The Operator station function is divided in principle into three parts:

- Presentation. Display elements, Time logged properties
- Dialog
- Event handling.

5.4.1 Presentation

Display elements which can be used for different display types are available for use in the functional unit Digital Output.

The display elements show the status and the controls of the process with different degrees of detail and is intended for the following displays:

- Object display
- Group display
- Object closeup display
- Process display.

Examples of different display elements which could be used in these displays are given in the following section. A complete list of the prepared elements available is provided in the manual *AdvaCommand User Interface Reference Manual.*

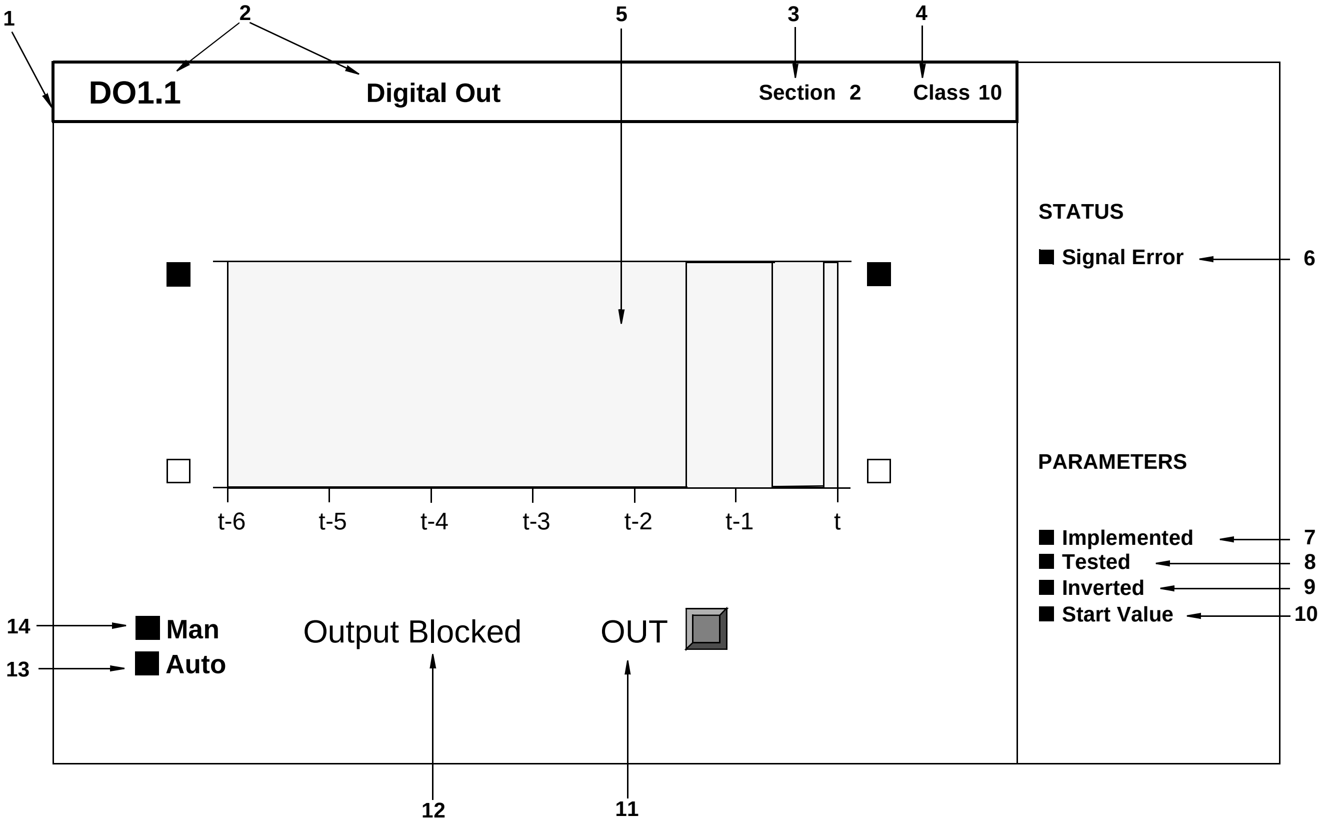
Detailed information of alternative way of presentation of certain status and data within the displays such as color, flashing, blocked etc. is given in the referenced manual.

Time-logged Properties

Measured values stored can be presented graphically in form of curves on the display screen. Such a display, a **trend displa**y, can consist of 1-4 curves.

For the functional unit Digital Output the signal value can be logged and presented. The logged property is designated OUT.

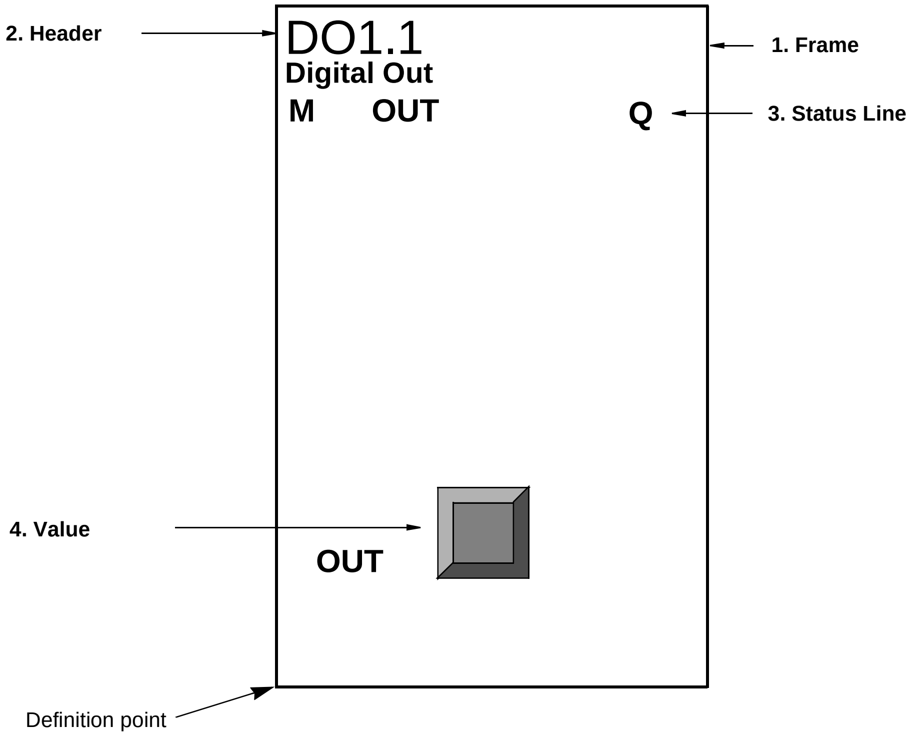
Object display: DOOB01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
4.1	Section Text	
4.2	Section Value	Process section
5.1	Class Text	
5.2	Class Value	Object class
3.1	Value Trim Curve	
3.2	Range Indicators	
6	STATUS	
6.1	Signal error Indication	I/O Error
6.2	Signal error text	
7	PARAMETERS	
7.1	Implemented Indication	
7.2	Implemented Text	

No	Description	Remarks
8.1	Tested Indication	
8.2	Tested Text	
9.1	Inverted Indication	
9.2	Inverted Text	
10.1	Start Value Indication	
10.2	Start Value text	
11.1	OUT Text	
11.2	Value	
12	Output Blocked	
13.1	Auto Indicator	
13.2	Auto Text	
14.1	Man Indicator	
14.2	Man Text	

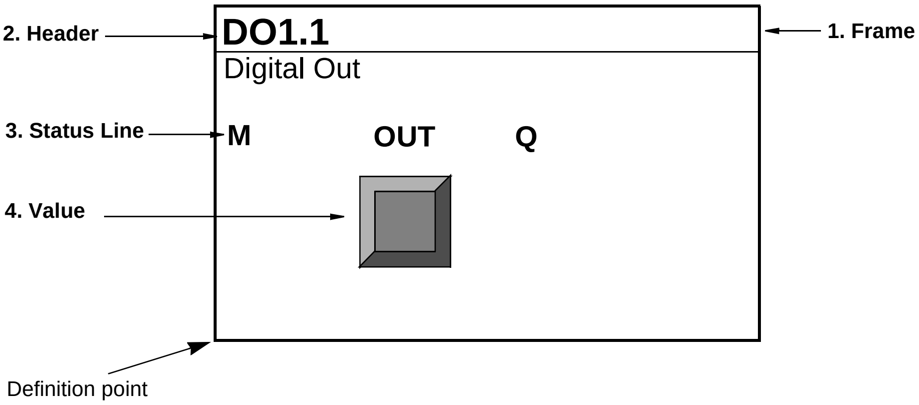
Display Element for Group display: DOGR01



No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	

No	Description	Remarks
3.2	Output Blocked	
3.3	Error Indication	I/O Error
4.1	OUT Text	
4.2	Value	

Display Element for Object closeup display: DOWI01

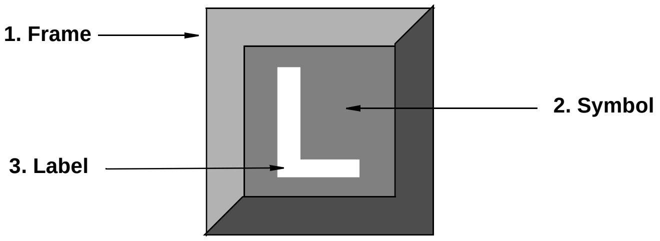


No	Description	Remarks
1	SelectFrame	
2	Header	Object name and description
3	Status Line	
3.1	Mode	

No	Description	Remarks
3.2	Output Blocked	
3.3	Error Indication	I/O Error
4	Value	

Display Element for Process display:

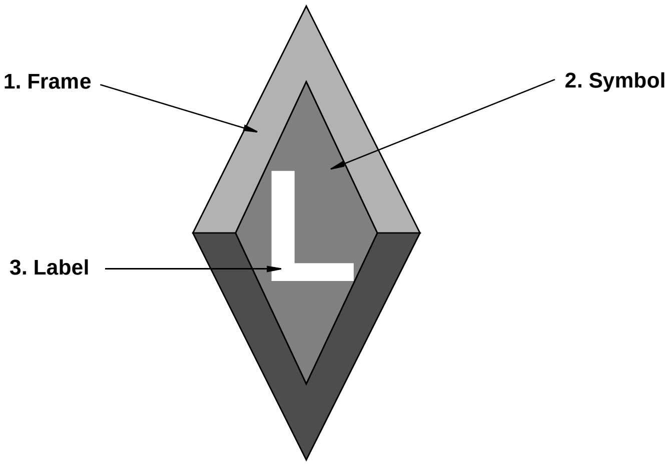
DOPD01



No	Description	Remarks
1	SelectFrame	
2	Symbol Center Color	

No	Description	Remarks
3	Label	User defined character

DOPD02



No	Description	Remarks
1	SelectFrame	
2	Symbol Center Color	

No	Description	Remarks
3	Label	User defined character

5.4.2 Dialog

The display screen is supplemented with a keyboard for operator communication with the functional unit/object.

The dialog is built up using both fixed and dynamic keys. The functions available with the dynamic keys are presented in a pattern of rectangles on the lower part of the display screen when the object is selected. The functional unit Digital Output has a MIN dialog (Production level) and a MAX dialog (Maintenance level). The MIN dialog consists of an output dialog but no subdialogs. The MAX dialog consists of an output dialog with 1 subdialog.

MIN dialog (No authority key)

Keyboard keys

◇	**On**	Set value to one
▽	**Off**	Set value to zero
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select object display

Dynamic keys, Keyboard

D1 ■ On	D2	D3	D4	D5
D6 ☐ Off	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

On	Set value to one
Off	Set value to zero
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

MAX dialog (Authority key)

Keyboard keys

◇	**On**	Set value to one
▽	**Off**	Set value to zero
Man	**Man**	Set to manual mode
Auto	**Auto**	Set to automatic mode
✓	**Acknowledge**	Acknowledge alarm
📈	**Object Trend**	Select Object Trend
Object	**Object Display**	Select Object Display
Dialog	**Previous Level**	Select Top Level dynamic keys

Dynamic keys, Top Level

D1 Block Output	D2	D3	D4	D5
D6 Deblock Output	D7	D8	D9	D10 *Keyboard...*

Block Output	Block output signal
Deblock Output	Deblock output signal
Keyboard...	Select Dynamic keys: Keyboard

Dynamic keys, Keyboard...

D1 ■ On	D2 Man	D3 Auto	D4	D5
D6 □ Off	D7 Acknowledge	D8 Object Display	D9 Object Trend	D10

On	Set value to one
Man	Set to manual mode
Auto	Set to automatic mode
Off	Set value to zero
Acknowledge	Acknowledge alarm
Object Display	Select Object Display
Object Trend	Select Object Trend

5.4.3 Event Handling

There is no event handling included in the standard implementation of the functional unit Digital Output.

5.5 Function Diagram

The function diagram in section A.5 in Appendix A describes in detail the relation between all input and output signals in the functional units. Figure A-1 in Appendix A explains the used designations in the circuit diagram.

Appendix A Function Diagram

A.1 General

The function diagram describes in detail the relation between all input and output signals in the functional units. The figure below explains the used designations in the circuit diagram.

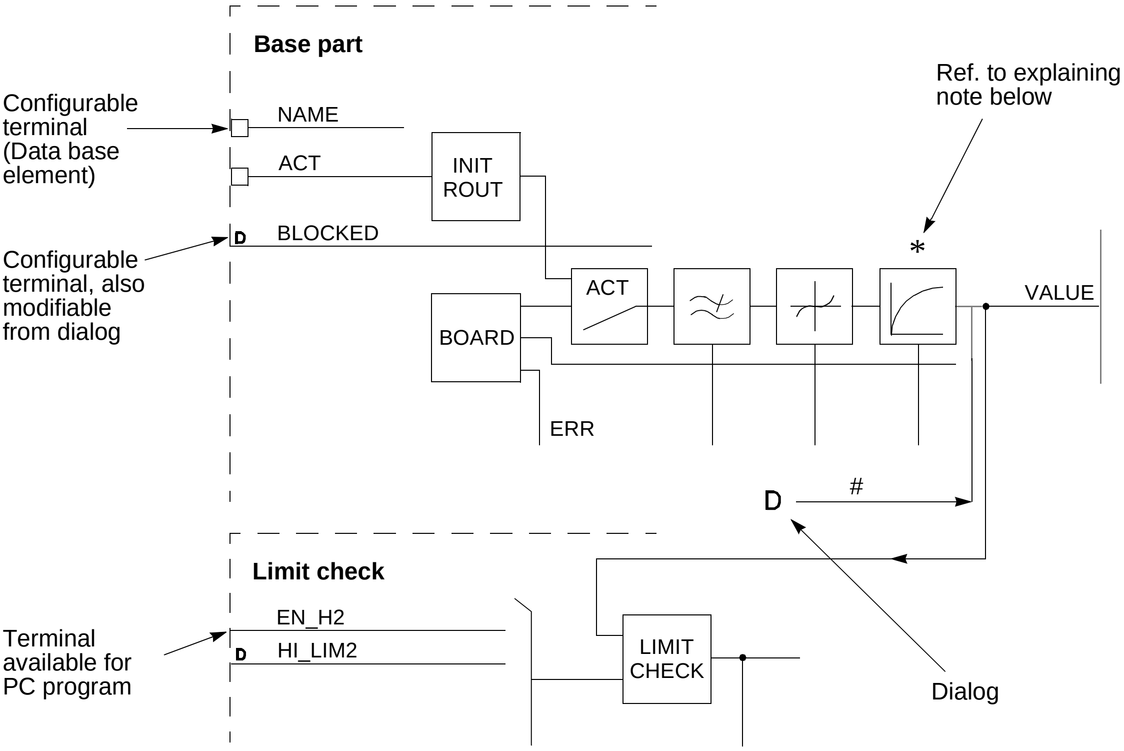
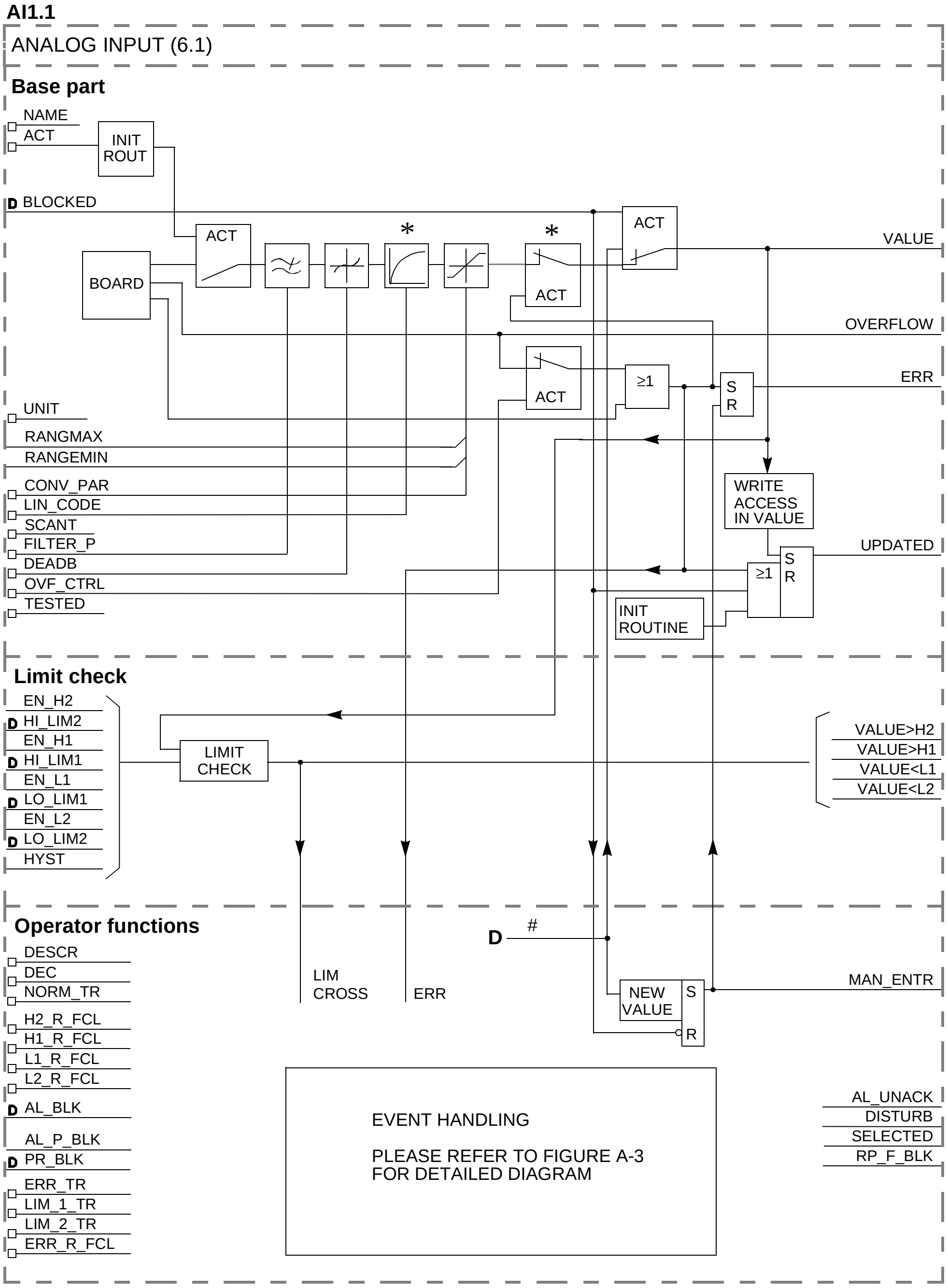

Base part
Ref. to explaining note below
Configurable terminal (Data base element)
NAME
ACT
INIT ROUT
D
BLOCKED
Configurable terminal, also modifiable from dialog
*
ACT
VALUE
BOARD
ERR
D
#
Limit check
EN_H2
D
HI_LIM2
Terminal available for PC program
LIMIT CHECK
Dialog

Figure A-1. Designations in the function diagram

A.2 Analog Input



* Function included in local I/O only.

Figure A-2. Function Diagram, Analog Input signal, AIS

A.2.1 Event Handling

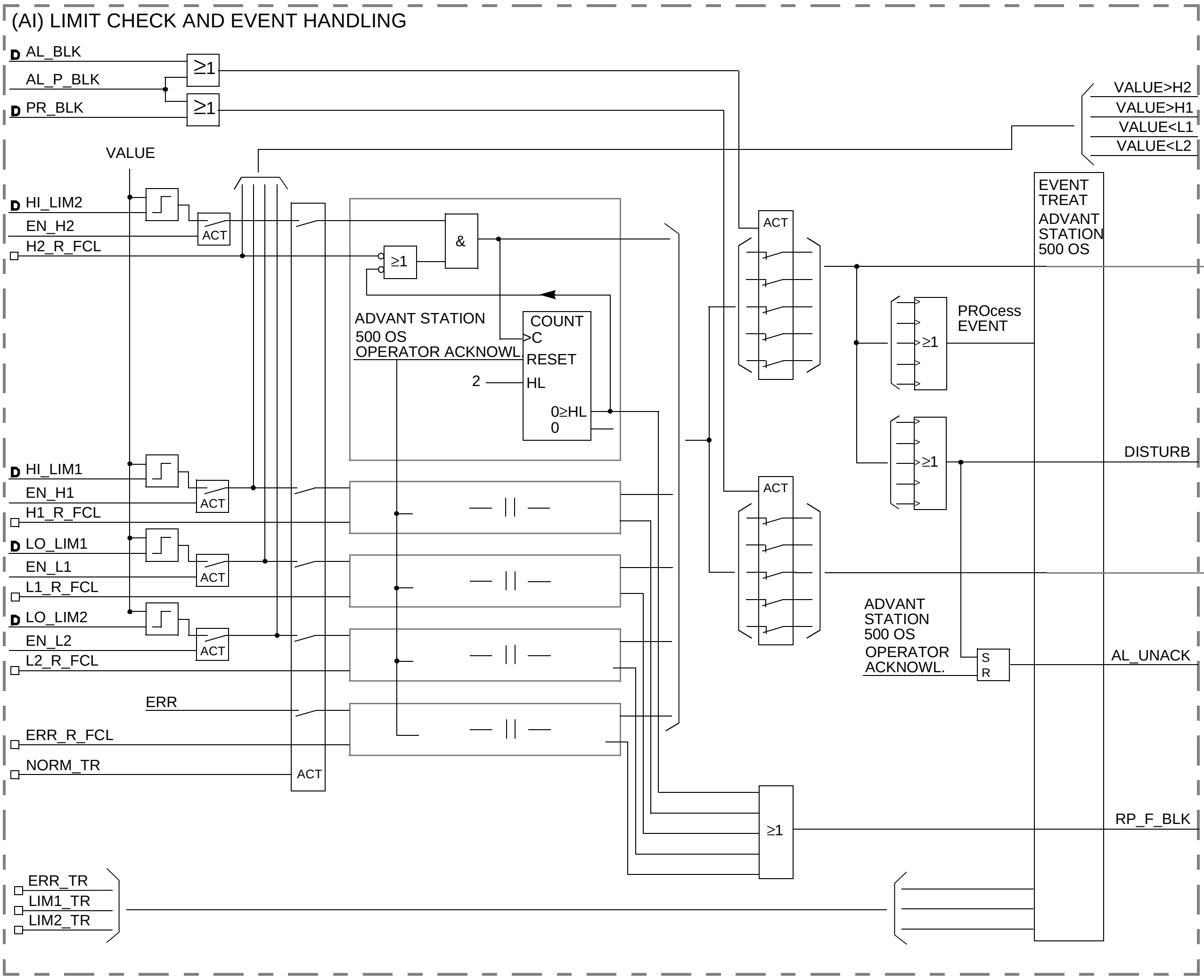


Figure A-3. Function Diagram, Analog Input - Event handling

A.3 Analog Output

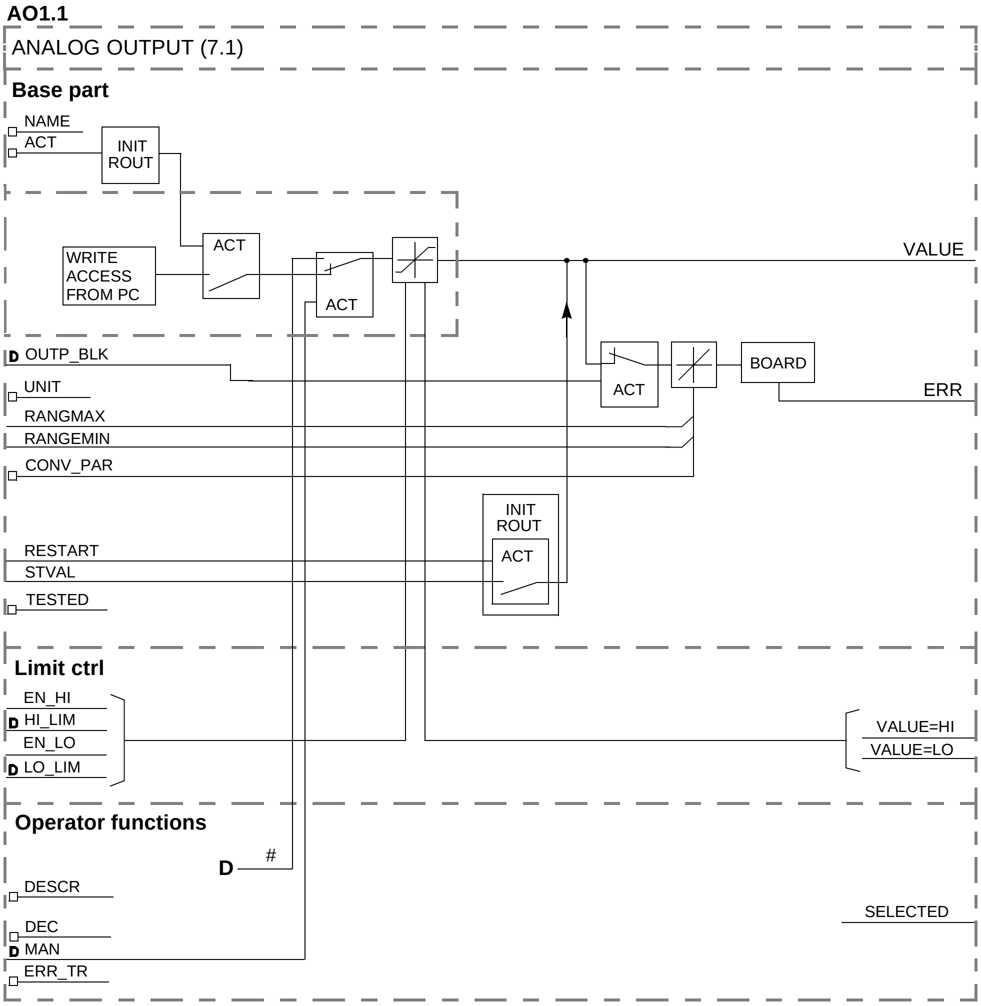


Figure A-4. Function Diagram, Analog Output signal, AOS

A.4 Digital Input

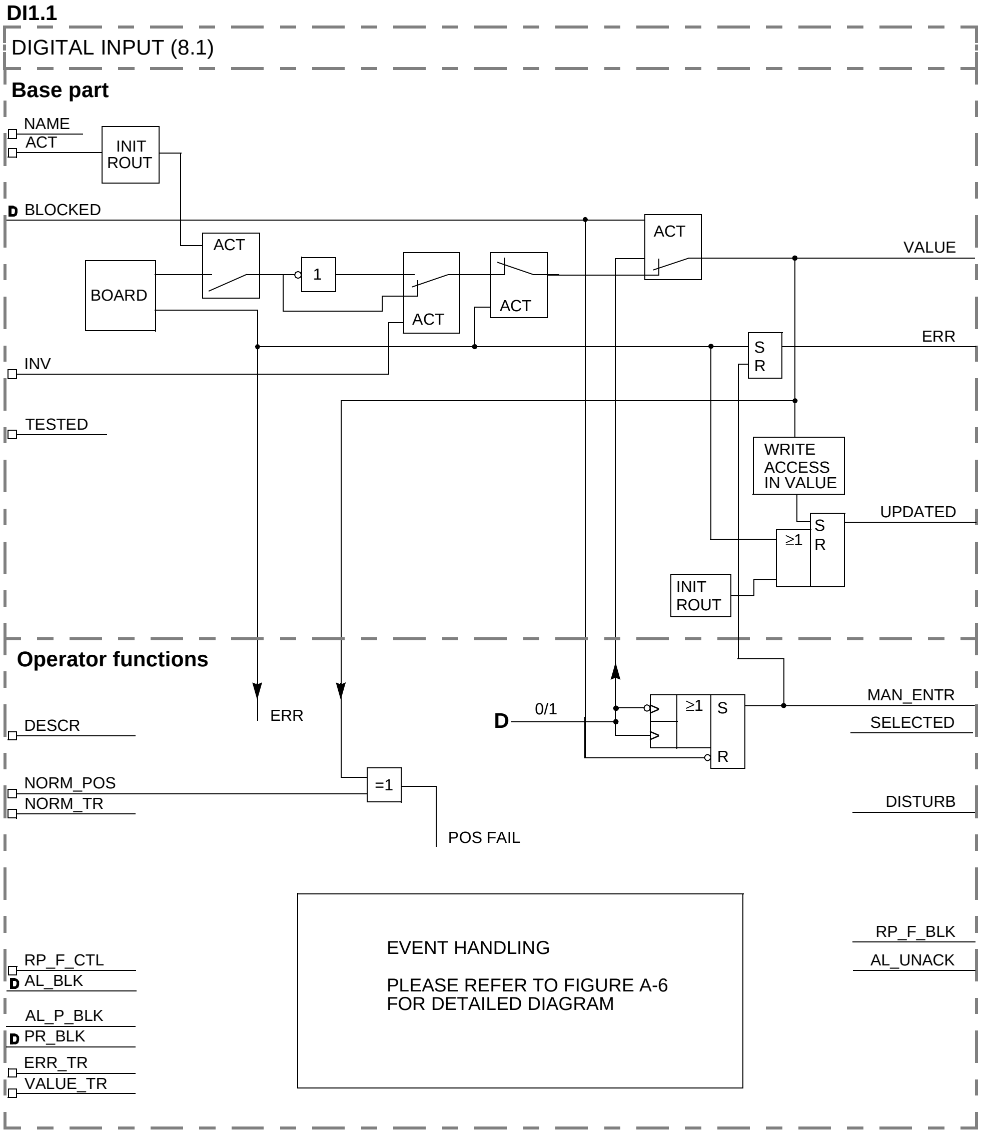


Figure A-5. Function Diagram, Digital Input signal, DIS

A.4.1 Event Handling

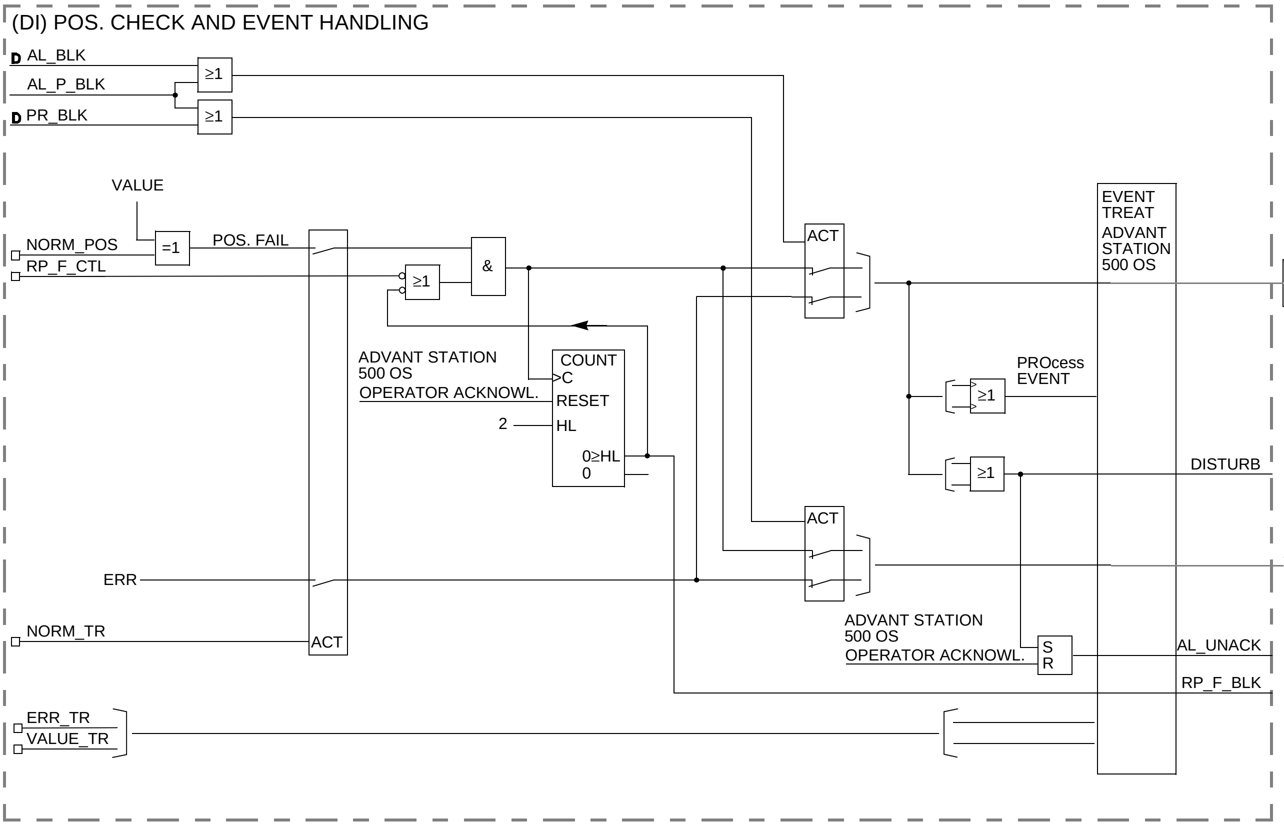


Figure A-6. Function Diagram, Digital Input - Event handling

A.5 Digital Output

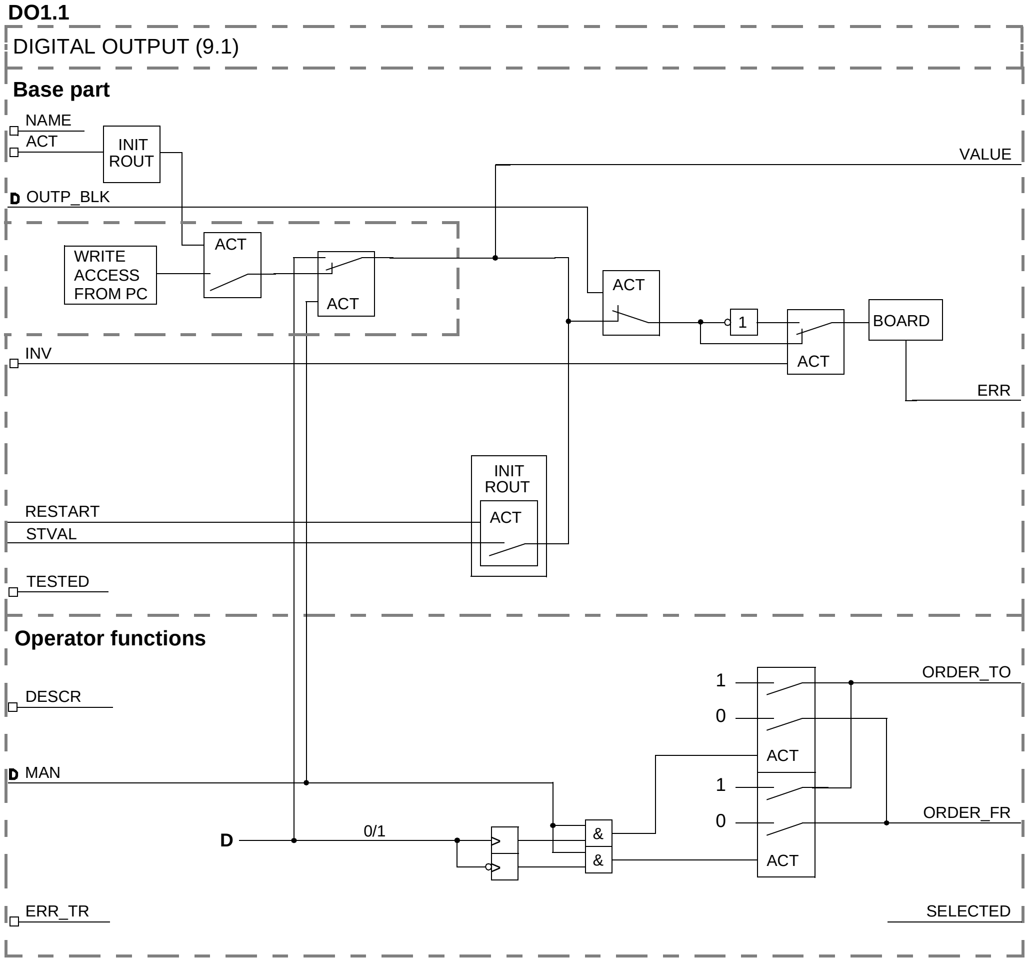


Figure A-7. Function Diagram, Digital Output signal, DOS

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